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COOK (H. T.). **The control of powdery mildew of snap Beans.**—Reprinted from *Trans. Peninsula Hort. Soc.*, xxii, 5, 4 pp., 1932. [Received July, 1933.]

Of 11 fungicides tested in 1931 at the Virginia Truck Experiment Station for their efficacy against powdery mildew [*Erysiphe polygoni*] of snap beans [*Phaseolus vulgaris*: *R.A.M.*, xi, p. 346], kolofog [ibid., xi, p. 788], kolodust [ibid., xi, p. 385], lime-sulphur dust, and dry lime-sulphur spray gave the most satisfactory results. For practical purposes the last-named should prove generally effective if applied three or four times, beginning soon after the first appearance of the disease.

HOGGAN (ISMÉ A.). **Some viruses affecting Spinach, and certain aspects of insect transmission.**—*Phytopath.*, xxiii, 5, pp. 446–474, 5 figs., 1933.

The writer's investigations [a comprehensive, tabulated account of which is given] in Wisconsin have shown that spinach is susceptible to at least three different virus diseases, namely, those caused by the cucumber mosaic, sugar beet mosaic, and tobacco ring spot viruses [*R.A.M.*, x, p. 574; xii, pp. 473, 539]. All three diseases are characterized by conspicuous yellowing and necrosis of the foliage, while the two first-named frequently cause the death of the whole plant.

Cucumber (Select White Spine) mosaic was found to be transmissible to sugar beet, local lesions resulting from inoculation by needle pricks and rubbing, as well as by the aphids, *Myzus persicae* and *Macrosiphum solanifolii* [*M. gei*] when these were confined to single leaves. Systemic infection, on the other hand, developed when the insects were allowed to wander freely over the plants. Cucumber mosaic was further shown to be transmissible to Bloomsdale spinach both by aphids and by artificial inoculation, the symptom sequence on this host closely resembling that of spinach blight, as originally described by McClintock & Smith (*Journ. Agric. Res.*, xiv, p. 1, 1918). The Virginia Savoy variety, known to be resistant to the latter disorder, shows definite indications of resistance to cucumber mosaic under greenhouse conditions. Moreover, spinach plants from Long Island, reported to be naturally infected by blight, were found to harbour the cucumber mosaic virus (cucumber virus 1) [*R.A.M.*, x, p. 60; xi, p. 349].

Sugar beet mosaic was readily transmitted to spinach by aphids and by artificial inoculation, no indication of resistance being given by the Virginia Savoy variety. The symptoms of this disease on spinach differ in several respects from those of blight, though closely resembling a spinach mosaic described from Germany [ibid., ix, p. 428]. The longevity *in vitro* of the sugar beet mosaic virus was 24 to 48 hours at 70° F., the tolerance to dilution 1 in 1,000, and the thermal death point for a ten-minute exposure 55° to 60° C.

Tobacco ring spot proved to be readily communicable to both spinach varieties by artificial inoculation, but not by aphids. The infected plants developed large, chlorotic areas with a marked tendency to necrosis but no malformation of the leaves, while recovery frequently took place, especially in warm weather. These symptoms bear no marked resemblance to those of spinach blight.

No indication was obtained of direct transmission of the cucumber mosaic virus from infective aphids (*M. gei*) to their progeny.

RIBEREAU-GAYON [J.]. **Sur le mécanisme de l'action des composés cupriques contre le mildiou.** [On the mechanism of the action of copper compounds against mildew.]—*Comptes rendus Acad. d'Agric. de France*, xix, 16, pp. 550–555, 1933.

The writer propounds the following theory, based on his experiments with yeasts in which he found that they can absorb and fix almost the whole of the copper present in dilute solutions, to explain the toxicity of copper compounds towards vine mildew [*Plasmopara viticola*: *R A.M.*, xi, p. 663].

When a zoospore is placed in a sufficiently strong copper solution its development is impeded by rapid absorption and fixation in the cell of the large number of copper ions in its vicinity. In a very dilute solution the zoospore fixes the few ions around it, but these do not suffice to prevent its germination before the diffusion of the remoter ions re-establishes the balance of the concentration. If, however, a particle of a copper compound, even a practically insoluble one, comes into direct contact with the zoospore, it dissolves proportionately with the fixation of the copper ions by the latter, a process facilitated by the cell secretions. The copper is conveyed in minute quantities from the copper particle to the zoospore, where it accumulates with a lethal effect. In this way an impression of contact action is produced by what is in reality a process of dissolution.

Assuming that this hypothesis is correct, the toxicity of a copper compound towards vine mildew is necessarily dependent on dissolution, in which, however, rapid solubility is not the primary factor. Among the most important factors in the efficacy of a copper fungicide are the concentration of copper ions, the presence of non-ionized copper in various forms, the hydrogen-ion concentration, and the presence of calcium salts, of an acid, or of a substance of the nature of carbon dioxide, any of which may assist in the dissolution of copper compounds, though some of these may simultaneously reduce copper fixation by the zoospores, so that

their inclusion is not necessarily advantageous. The exact *dosis toxica* for an anti-mildew copper fungicide can thus hardly be defined. Furthermore, a fungicidal action may be exerted not only by copper oxide, but also, following the same mechanism, by basic oxides or basic dyes, acting as positively charged metallic ions [cf. ibid., xi, p. 663].

[This paper is reprinted in *Rev. de Vitic.*, lxxviii, 2032, pp. 362–364, 1933.]

FRAPPA (C.). **Sur la présence de l'anthracnose de la Vigne dans certains vignobles du centre de Madagascar.** [On the presence of anthracnose of the Vine in certain vineyards in the central region of Madagascar.]—*Bull. Écon. Mens.*, Madagascar, N.S., 77, pp. 51–52, 1933.

Attention is drawn to the detection in November, 1932, in the Antananarivo and Miarinarivo districts of Madagascar, of anthracnose of the vine (*Gloeosporium ampelophagum*), a brief, popular note on the symptoms and control of which is given.

RAVAZ (L.), DUPONT (E.), & CALLAUDAUX (R.). **Recherches sur le rougeau de la Vigne.** [Researches on rougeau of the Vine.] —*Ann. Agron.*, N.S., iii, 2, pp. 225–231, 1933.

The non-parasitic rougeau disease of the vine (known as flavescence on the white and grey grape varieties) [*R.A.M.*, xii, p. 487] affects *Vitis vinifera* but not American vines, while very few non-grafted hybrids are affected, nearly all those which are susceptible (Alicante-Ganzin, 4646 S, 142 E.M., etc.), being derived from crosses with dark varieties which give colour to the wine, such as Teinturier du Cher, Petit Bouschet, and Alicante Bouschet.

After heavy rain from 8th to 11th September, 1931, rougeau was general in France, though later on the abnormal colouring tended to disappear, especially with the onset of the first frosts. This was particularly well marked in one experimental vineyard in which Aramon gris was interplanted with a few Aramon rouge vines; the vineyard is grafted mainly on Riparia, with a small part on 420 A. In this vineyard rougeau and flavescence were present in the parts given nitrogenous dressings as well as in the unmanured control plots, but the vines which received a heavy application (1 kg. per plant) of potassium sulphate remained unaffected. Chemical analysis of the contents of the flavescent leaves showed them to be deficient chiefly in potash. The affected leaves retained their redness long after the normal ones had begun to show an autumnal colouring, and remained on the branches until the first frosts set in; they were very resistant to frost as well as to mildew [*Plasmopara viticola*].

Analyses of leaves of the same age taken from healthy and affected (flavescent) vines on 23rd September revealed a marked deficiency of potash in the latter. Later on the contents of the leaves are transported to the woody parts of the normal vines, this emigration coinciding with the onset of autumnal colours from October. Of two adjacent vines of the same variety, stock, and age the leaves of one (healthy) developed the usual autumnal appearance while those of the other (with rougeau) remained red,

turgescent, and curved inwards. Analysis of the leaves, branches, and roots on 4th November showed that as regards dry material the leaves and branches of the affected vine were deficient in lime and had an excess of nitrogen and potash in comparison with the healthy vine, while as regards fresh material every constituent (including starch) was present in excess. Evidently therefore the autumn transfer of food and mineral materials had been completely arrested in the affected vines.

It is concluded that flavescence and rougeau are associated mainly with potash deficiency in the aerial organs. In soils which have not been specially fertilized insufficient potash is taken up by the vine, probably owing to some obstacle the nature of which has not yet been determined. When the period of migration of the contents of the green parts sets in in the late autumn, this process in affected vines is arrested, probably as a result of imperfect functioning of the roots in compacted, badly aerated soils, these being those in which rougeau or flavescence first appears and which can be readily improved by applications of potash. Vines grown in pots containing soil to which an excess of potash had been added showed better root development than others in the same soil without the addition of potash. Potash applied to the soil in large quantities, besides being effective against 'brunissure' [ibid., ix, p. 287], thus protects vines against rougeau for several years and improves the qualities of the grapes.

MARCHAL (E.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1932.** [Observations and researches carried out at the State Phytopathological Station during the year 1932.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, ii, 2, pp. 147–159, 1 chart, 1933.

This report [cf. *R.A.M.*, xii, p. 7] contains among others the following items of phytopathological interest.

In the spring of 1932 an important infection of rye by *Marssonia secalis* Oud. [*Rhynchosporium secalis*: ibid., viii, p. 302; xi, p. 282] occurred in Flanders, where *Gibberella saubinetii* was also very common on wheat.

The opinion previously held by the author that infection by *Hypochnus* [*Corticium*] *solani* does not seriously injure the growth and yield of potatoes under Belgian conditions has now been revised as a result of further information. *C. solani* becomes actively parasitic when the tuber sprouts develop, causing them to remain stunted, the tips withering and dying. In one attack of *C. solani* on the shoots of Eerstelingen [Duke of York] potatoes, the stems developed an apparently secondary infection by *Colletotrichum atramentarium* [ibid., xi, pp. 144, 323] hitherto found only exceptionally in Belgium.

As a rule, sugar beets in Belgium sustain very little injury from leaf spot (*Cercospora beticola*), but in 1932 as a result of leaf development being hastened by the prevailing weather conditions, infections were already general early in September and subsequent spread killed many of the leaves.

Serious injury was caused to turnips growing near Bruges by

Cercosporella albomaculans [ibid., viii, p. 269], this being the first record of the fungus in Belgium.

Flax in experimental plots at Gembloux was slightly affected by *Fusicladium lini* [ibid., ix, p. 16].

A bacterial rot of lettuces [? *Bacterium marginale*: ibid., xii, p. 353], beginning as a blackening of the edges of the outer leaves and spreading (frequently very quickly) to the head, reached epidemic proportions in the vicinity of Liége, where it was thought, mistakenly, to have been introduced from abroad; it appears, however, to be known practically all over western Europe, and to have been present near Namur for many years.

Chrysanthemums were attacked by *Sclerotinia fuckeliana*, *Septoria chrysanthemi* [ibid., x, p. 245], *Puccinia chrysanthemi*, *S. rostrupii* [ibid., xi, p. 785], and, in one of the largest nurseries in the country, by *Fusarium dianthi* [ibid., xi, p. 768] which produced collar-canker and caused the plants rapidly to succumb.

Wilting of young plum trees may be caused in Belgium by various fungi; in many cases seen by the author in 1932 the disease was due either to *Verticillium albo-atrum* [ibid., ix, p. 6] or to *Diaporthe perniciosa* [ibid., vii, p. 647].

A comparative study of French and Belgian material of the canker of Canadian poplar [*Populus canadensis*: ibid., xi, p. 94; xii, p. 127] showed the organisms present in the diseased tissues of the trees from both countries to be in all respects similar. In addition to *Nectria galligena*, the author found that the bark over the cankers almost always showed the presence of *Cytospora chrysosperma*, the pycnidial stage of *Valsa sordida* [ibid., x, p. 418]. When cankered branches were sheltered from rain, characteristic orange-coloured cirrhi developed at the edges of the lesions. Very frequently, isolations from affected tissues gave a mycelium developing into blackish pseudostromata from which, in turn, the fructifications of a *Diaporthe* were obtained. Inoculation tests failed to establish the cause of the cankers, but are to be renewed.

Abies branches from Bruges showed galls resembling those described by P. Hennings in 1898 on *A. balsamea*, *A. pichta* [*A. sibirica*], and *A. subalpina* [*A. lasiocarpa*] in Berlin as due to *Pestalozzia tumefaciens*; a fungus considered to be this species, though the measurements did not coincide, was isolated from the author's material, constituting a new record for Belgium.

Bolens (G.), Rapin (J.), & Paul (L.). **Rapport d'activité de l'Établissement fédéral d'essais et de contrôle de semences de Lausanne (Mont Calme) durant la période 1927–1932.** [Report on the work of the Federal Experiment and Seed Testing Station of Lausanne (Mont Calme) during the period 1927–1932.]—*Annuaire Agric. de la Suisse*, xxxiv, 4, pp. 425–489, 10 figs., 3 graphs, 1933.

The following items of phytopathological interest occur in this report. Very satisfactory results in the elimination of potato virus diseases were obtained by the cultivation of selected units of varieties such as Centifolia, Early Yellow, Millefleurs, and King George, in mountainous districts for subsequent distribution in the plain [*R.A.M.*, xii, p. 461]. Details are also given of the measures taken

during recent years to test indigenous and imported stocks of seed potatoes for freedom from virus and other diseases, as well as of an extensive series of tests on varietal reaction to wart disease [*Synchytrium endobioticum*], with a list of the varieties officially passed as immune [ibid., xii, p. 189].

In addition to the foregoing potato diseases, the attention of the Station staff has been occupied by studies on a number of cereal diseases and on tobacco wildfire [*Bacterium tabacum*]. Experiments were further conducted with several newly recommended fungicidal treatments, and lectures given on phytopathological and related subjects.

EASTHAM (J. W.). **Report of Provincial Plant Pathologist.**— *Twenty-seventh Ann. Rept. Dept. of Agric. British Columbia for the year 1932*, pp. U29–U34, 1933.

Comparative tests were conducted in three orchards in the west Kootenays to determine the relative merits of standard lime-sulphur (1 in 40) and of a combination of half-strength lime-sulphur and 6¼ lb. calcium sulphide [*R.A.M.*, ix, p. 792] per 80 galls. in the control of apple scab [*Venturia inaequalis*], six applications being given between 21st April and 23rd June. No appreciable difference was apparent in the efficacy of the preparations, both of which gave satisfactory control in a very severe outbreak of the disease, with profuse development of the pin-head form on the fruit [ibid., viii, p. 155] following heavy rains at the end of August. The latter is a somewhat rare feature, having been observed only three times in the past 18 years.

Some 70 per cent. of the tomatoes in a consignment from Mayne Island showed a black spotting apparently due to *Macrosporium* [*Alternaria*] *solani* [ibid., xi, p. 680 *et passim*], while 5 per cent. had broken down completely. In four other crates examined at Victoria the percentage of black spot ranged from 20 to 43·7. An inspection of the crops on Mayne Island revealed striking contrasts in regard to the incidence of infection, which in some cases caused a practically total loss, while in others only an occasional spot was observed on the leaf or 'nail-head' on the fruit. Another trouble consisted in the development, on the 'shoulder' round the stem-end of semi-ripe fruits, of soft areas with a brownish or freckled appearance, not associated with any micro-organism and probably attributable to the excessive use of chicken manure.

Leaf rust of raspberries (*Phragmidium imitans*) [ibid., ix, p. 535] was prevalent and fairly severe in the Fraser Valley. Raspberry mosaic of the mild mottling type is very general but any pronounced distortion or dwarfing is rare. Certified stock is being produced by three nurseries. Cane blight (*Leptosphaeria coniothyrium*) is the most serious raspberry disease in the districts under observation, though it seldom kills more than 5 per cent. of the canes in a planting or over 25 per cent. of those on an individual plant. Powdery mildew [*Sphaerotheca humuli*: ibid., vii, p. 727; ix, p. 324] was very severe on the Latham variety, preventing inspection for virus diseases in one planting. An undetermined fungus appears to be responsible for a fruit blight of raspberries and loganberries [*Rubus loganobaccus*], infection taking place

through one or more drupelets usually after 1st June; mycelium was detected in the latter and in the adjacent diseased areas of the receptacle.

Wood (Jessie I.), Stevens (N. E.), & Miller (P. R.). **Diseases of plants in the United States in 1932.**—*Plant Disease Reporter, Supplement* 85, 82 pp., 17 graphs, 10 maps, 1933.

Attention is drawn, in a foreword to this report [cf. *R.A.M.*, xii, p. 493], to the inevitable restrictions on phytopathological investigations in the United States during 1932. Interest was largely concentrated on bacterial wilt of maize (*Aplanobacter stewarti*) [see below, p. 688] and downy mildew of tobacco (*Peronospora hyoscyami*) [ibid., xii, p. 538 and below, p. 732], both of which were remarkable for virulence and extent. Maps are given showing the distribution of white pine blister rust (*Cronartium ribicola*) and phony peach [ibid., xii, p. 575] during the period under review.

Report of the Louisiana Agricultural Experiment Station for the years 1929–31.—140 pp., 4 figs., 1 graph, 1 map, [1932. Received July, 1933.]

The following items occur in the section of this report dealing with plant pathology (pp. 105–112). C. W. Edgerton, E. C. Tims, and P. J. Mills found that the direct losses from sugar-cane mosaic in the Striped, P.O.J. 36M, P.O.J. 36, and P.O.J. 234 varieties average some 10 per cent. annually [*R.A.M.*, xi, p. 265]. At Reserve the ordinarily resistant P.O.J. 213 and Co. 281 varieties contracted the disease in a virulent form apparently distinct from that occurring elsewhere in the State. Red rot [*Colletotrichum falcatum*: see below, p. 724] has become a serious problem on the P.O.J. 213, P.O.J. 36M, and C.P. 807 varieties, the first-named suffering severely in the field. *F. moniliforme* [*Gibberella moniliformis*], the agent of pokkah boeng disease [ibid., xii, p. 590], was found by P. J. Mills to be of common occurrence on a number of cultivated plants as well as the P.O.J. 234 sugar-cane variety. Inoculation tests with cultures of the fungus from maize, onion, and sugar-cane gave positive results on the latter. E. C. Tims obtained a certain reduction in the infection of sugar-cane in sterilized soil by *Pythium arrhenomanes* [ibid., xi, p. 28] by the inoculation of the soil with some Actinomycetes of proved antagonism to the fungus; no appreciable diminution in the incidence of infection resulted from the omission of maize from the rotation.

Root rot of beans [*Phaseolus vulgaris*] associated with *Rhizoctonia* and *Pythium* spp., was found by L. H. Person to be particularly injurious in the alluvial sections of the State.

Effective control of leaf spot and scorch of strawberry (*Mycosphaerella fragariae* and *Diplocarpon earliana*, respectively) [ibid. xi, p. 463] was obtained by A. G. Plakidas in four years' experiments by spraying with 4–4–50 Bordeaux mixture every ten days from the beginning of January to early March, resulting in a marked increase of yield (107¼ and 219 crates per acre in 1930 and 1931, respectively). The optimum temperature for the development of *D. earliana* was found to be about 10° F. higher than that for *M. fragariae*, a fact that explains the prevalence of the former

during the summer months, while the latter is most severe in the winter and early spring. *M. fragariae* enters the leaf tissues through the stomata and *D. earliana* directly through the epidermis. Several strains of *Pythium* and one species each of *Phoma*, *Fusarium*, and *Rhizoctonia* isolated from decaying strawberry roots proved to be more or less pathogenic in pot experiments.

An [unnamed] fungus was constantly found associated with the rosette or double blossom disease of blackberries and dewberries (*Rubus* spp.), mycelium and spores occurring in the affected blossoms between the floral elements and between the bud scales. Promising results in controlling the disease were obtained by regular applications of 4–4–50 Bordeaux mixture during a period of eight months.

A species of *Sphaeropsis* and (?) *Clitocybe parasitica* [*C. tabescens*: ibid., iv, p. 586] were isolated from the roots of dying Pineapple pear trees, the latter being apparently the main cause of the disease.

BOURIQUET (G.). **Réunion: plant parasites newly recorded in the Island.**—*Internat. Bull. of Plant Protect.*, vii, 6, p. 123, 1933.

The following plant pathogens, all believed to be new to Réunion, were recently observed on the Island by the writer: *Gloeosporium manihotis* on cassava [*R.A.M.*, xii, p. 352]; *Erysiphe cichoracearum* on tobacco [ibid., xi, pp. 333, 677]; *Puccinia maydis* on maize; *P. pruni-spinosae* [ibid., xi, p. 559] and *Taphrina deformans* on peach; *Rhizopus artocarpi* on *Artocarpus integrifolia* [ibid., ix, p. 64]; *Ovulariopsis papayae* [ibid., i, p. 106] on papaw; *Colletotrichum lindemuthianum* and *Isariopsis griseola* [ibid., xi, p. 431] on French beans [*Phaseolus vulgaris*]; *Phytophthora infestans* on potato; *Cercospora* sp. on eggplant; *O.* sp. on *Erythrina indica*; *Sphaerophragmium acaciae* on *Albizzia lebbek*; *Phyllactinia corylea* on mulberry [ibid., x, p. 343]; and *Microsphaera alphitoides* [*M. quercina*] on oak.

STAPP (C.) & BORTELS (H.). **Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens. III. Mitteilung. Zur Frage der Bekämpfung.** [Crown gall of plants and its causal organism, *Pseudomonas tumefaciens*. Note III. On the problem of control.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxviii, 13–16, pp. 313–319, 6 figs., 1933.

Twenty plants each of *Pelargonium zonale* (Schöne Ulmerin variety), tomato, and *Datura stramonium* were inoculated in the greenhouse with *Pseudomonas* [*Bacterium*] *tumefaciens* (strain *Chrys*[*anthemum*] *frut*[*escens*] 11b) [*R.A.M.*, xi, p. 357]. Five plants in each of the three series were immediately encircled round the stems by a copper wire similar to Lakhovsky's oscillator for the interception of cosmic rays and their concentration on the plant [ibid., vii, p. 564], a further five in each lot being subjected to the same treatment a month after inoculation. Tumours on another five plants in each series, after two months' development, were exposed to the influence of Röntgen rays, but neither in this

case nor in that of the copper-wire treatment was any remedial effect produced on tumour or plant.

Dodoff (D. N.). **Die epidemische Entwicklung der Weizenroste in Nordbulgarien im Jahre 1932.** [The epidemic development of the Wheat rusts in northern Bulgaria in the year 1932.]—*Phytopath. Zeitschr.*, vi, 1, pp. 111–112, 1933.

The reduction in the 1932 wheat crops of northern Bulgaria from the black and brown rust [*Puccinia graminis* and *P. triticina*] epidemics is estimated at 30 to 100 per cent. in different areas, corresponding to a total financial loss of M. 30,000,000 [*R.A.M.*, xii, p. 150]. Individual farmers were granted a relief from taxation by the Government on account of the excessively heavy damage, and were further supplied with large quantities of wheat for seed and food. It is reported that during a thunderstorm an immense red cloud of rust spores passed over the Danubian plain, after which the harvest was completely destroyed by a renewal of infection. A contributory factor in the development of the epidemics was the protracted severe cold of the previous winter, which delayed the maturity of the plants by ten to twelve days. An experiment showed that the losses from rusts may be considerably reduced by timely sowing, the yield per hect. from 150 kg. seed-grain sown on 25th September, 1931, amounting to 1,925 kg. as compared with 590 kg. from the same quantity sown on 9th November. Generally speaking, the improved commercial varieties were highly susceptible, but a marked degree of resistance was shown by No. 159 R.V.S. and two selections from the Kneja Experiment Station. The system of biennial crop rotation is believed to be largely responsible for the frequent rust epidemics in Bulgaria.

Werner (O.) & Steiner (H.). **Fortlaufende Körpergewichtsbestimmungen an einer rostkranken und einer gesunden Weizenpflanze.** [Continuous body-weight determinations on a rust-diseased and a healthy Wheat plant.]—*Biol. Gen.*, Vienna, ix (i), 2, pp. 337–354, 7 figs., 1 graph, 1933.

Continuous gravimetric determinations [the results of which are fully discussed and tabulated] on two Carina C.I. 3756 wheat plants, one healthy and one inoculated with brown rust (*Puccinia triticina*), indicated that physiological activity is not impaired for a considerable time after infection, and consequently the reduction of dry weight is negligible.

Rivera (V.) & Corneli (E.). **Progressivo estendersi di epidemie da '*Urocystis*' su Frumento.** [The progressive extension of epidemics of '*Urocystis*' on Wheat.]—*Riv. Pat. Veg.*, xxiii, 3–4, pp. 171–176, 1933.

Since 1928 wheat growing in the vicinity of Perugia has been attacked with increasing severity by *Urocystis occulta* [generally known on wheat as *U. tritici* Koern.], reported on the same host at Pisa in 1927 and elsewhere in Italy as early as 1908. Infection has now reached epidemic proportions in the first-named locality; for example, one large field of the Virgilio variety near Lake

Trasimeno appeared likely at the time of writing (May, 1933) to lose one-fifth of its crop. The attack occurred early in April, late-sown wheat becoming affected a fortnight afterwards. The disease was equally severe on early sowings made in dry weather in the autumn and late ones made after very wet weather. The prevailing temperature was rather high during the 1932–3 sowing season. Large fields of rye in the same neighbourhood were unaffected, though adjacent fields of Gentil rosso wheat were badly attacked. Virgilio was the most susceptible variety and was affected in numerous parts of Umbria; near Lake Trasimeno Rieti wheat was much less affected than Virgilio or Gentil rosso, and Frassineto was almost immune; in Tuscany, however, the last-named variety was severely affected, and Zara and S. Maria wheats were also attacked. The spores are shed on the ground and germinate on the new seedlings, with the result that the affected areas remain the same but the disease becomes worse in them every year. Seed disinfection and the destruction of diseased material are regarded as likely to give effective control.

In January, 1931, Corneli sowed inoculated, untreated wheat seed in one pot and an equal number of similarly inoculated seeds in another, the latter having been previously immersed for 15 minutes in a 0·5 per cent. solution of copper sulphate and then dipped in milk of lime. On 30th April the untreated seed showed 50 per cent. infection as against only one diseased plant from the treated seed. In 1932 floral infections were made and the seed similarly disinfected before being sown. Although the embryos were presumably exposed to infection, none of the resultant plants showed the disease, from which it is concluded that infection usually results from spores in the soil attacking the wheat at the moment of germination.

ARNAUD (G.) & GAUDINEAU (Mlle M.). **Le traitement de la carie du Blé (1930–31 et 1931–32).** [Wheat bunt control (1930–31 and 1931–32).]—*Rev. Path. Vég. et Ent. Agric.*, xx, 4–5, pp. 188–196, 1 graph, 1933.

This is a summary account of the authors' experiments on the control of wheat bunt [*Tilletia caries*] in the region of Versailles; most of the information contained in it has already been noticed from other sources [*R.A.M.*, xi, p. 566; xii, p. 449].

NIEVES (R.). **La caries o carbón hediondo del Trigo.** [Bunt or stinking smut of Wheat.]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxii, 3, pp. 397–411, 3 figs., 1933.

Continuing his studies on wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] in the Argentine Republic [*R.A.M.*, x, p. 781], the writer was able to distinguish two local physiologic forms within the latter species and six within the former [ibid., xii, pp. 429, 618]. In general, the forms comprised within *T. foetens* are more virulent than those of *T. caries*, but form III of the latter, from Pellegrini, approaches those of the former group in virulence. The Lin Calel variety of wheat showed a high degree of susceptibility to all the physiologic forms under observation, whereas Rubión was immune from four, resistant to three,

and susceptible only to form II of *T. foetens*. Certain forms of both species (II of *T. foetens* and II and V of *T. caries*) proved to be capable of attacking rye [ibid., xi, p. 501].

The best control of wheat bunt has been given during seven years' experiments at Guatraché by abavit 26 and uspulun dust, but ibis, Caffaro powder, and vitrioline [see next abstract] may also be recommended for their stimulatory action. The best of the liquid preparations are uspulun-universal, segetan-n[eu], and kalimat. Directions are given for the application of these treatments.

Blanchard (E. E.) & Carrera (D. C.). **Causas que originan pérdidas en los cultivos de Trigos en el sur de la Prov. de Buenos Aires, este y norte de la Pampa.** [Causes responsible for losses among the Wheat crops in the south of the Province of Buenos Aires and in the east and north of La Pampa.]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxii, 1, pp. 1–10, 1933.

Foot rot of wheat, caused by *Ophiobolus graminis*, is stated to have been first recognized in the Argentine Republic 25 years ago, since when it has been responsible for severe losses (up to 50 per cent. of the crop) [*R.A.M.*, vii, p. 314]. Other hosts of the fungus include barley, rye, rice, *Bromus sterilis*, and *Hordeum murinum*, the last-named occurring in profusion in the southern part of Buenos Aires. In general, a temperature range of 12° to 16° C. is most favourable to the development of foot rot, which appears both in very damp and in very dry soils and seems also to be favoured by an alkaline reaction. Another form of foot rot in the Argentine is caused by *Helminthosporium sativum*, affecting wheat [cf. ibid., xi, p. 225], barley, rye, and a number of other grasses. The attacks of this fungus are favoured by a temperature range of 28° to 32° and an atmospheric humidity between 55 and 65 per cent., the latter being a particularly important factor in the development of infection in small plantings. Control measures should include rotation with the non-susceptible oats and maize; late sowing of winter wheat; burning of stubble; drainage of damp fields; avoidance of seeds showing a dark coloration of the embryonal area; and seed treatment with a standard dust, e.g., uspulun, abavit, Caffaro powder [ibid., i, p. 66 *et passim*], or vitrioline [ibid., xi, p. 289]. The same preparations are recommended against wheat scab due to *Gibberella saubinetii* (*Fusarium graminearum*), which also causes heavy damage to barley, rye, maize, and other cereals [ibid., xi, p. 505] in the country.

The information on the black, yellow, and brown rusts of wheat (*Puccinia graminis*, *P. glumarum*, and *P. triticina*, respectively) has already been summarized from other sources [ibid., xi, p. 499].

Broadfoot (W. C.). **Studies on foot and root rot of Wheat. I. Effect of age of the Wheat plant upon the development of foot and root rot.**—*Canadian Journ. of Res.*, viii, 5, pp. 483–491, 1 graph, 1933.

This is an expanded and tabulated account of studies which

have been in progress in Alberta since 1929 to determine whether, in sterilized, inoculated soil, Marquis wheat plants acquire a greater or lesser susceptibility as they grow older after the seedling stage to infection by *Ophiobolus graminis*, *Helminthosporium sativum*, and *Fusarium culmorum* [*R.A.M.*, xi, p. 708; xii, p. 534]. Owing to the complexity of the chemical, morphological, and environmental factors involved in the process of infection, no definite conclusion could be reached on the point at issue, though it was clear that the seedling stage is the most susceptible. It is necessary, for instance, to consider the effects of mutual association on the different fungi, of the development in sterilized soil of foreign micro-organisms, and of the date of inoculation, all of which have some bearing on the occurrence of the disorders under observation.

In sterilized soil, in open pot culture, the inoculum of *O. graminis* was more virulent alone than when mixed with *H. sativum*, *F. culmorum*, or *Leptosphaeria herpotrichoides*, singly or in combination. The virulence of all these fungi, as tested by sowing the seed at 10-day intervals from inoculation of the soil, declined progressively in sterilized (but subsequently unprotected) soil; the decrease was most marked during the first 40 days, after which they were only slightly pathogenic, the inoculum of *O. graminis* being reduced to impotence after 120 days. In unsterilized soil the virulence of the fungi under investigation was greatly diminished in comparison with the results obtained in sterilized soil, being practically at a minimum after ten days.

These data emphasize the importance of protecting inoculated, sterilized soil against contamination by other micro-organisms in critical studies made in soil [cf. ibid., x, p. 719], and further help to explain the recognized difficulty of inducing foot rot in the field by the addition to the soil of prepared inoculum.

Broadfoot (W. C.). **Studies on foot and root rot of Wheat. II. Cultural relationships on solid media of certain micro-organisms in association with Ophiobolus graminis Sacc.**— *Canadian Journ. of Res.*, viii, 6, pp. 545–552, 1 pl., 1933.

A comparative investigation was made of the antagonistic and compatible growth relationships of 66 cultures of bacteria and fungi, mostly from the soil, in association with *Ophiobolus graminis* on potato dextrose and Molisch's peptone agar and on wheat seedlings in open soil culture in Alberta [*R.A.M.*, xii, p. 109 and preceding abstract]

Of the 21 organisms controlling the virulence of the fungus in the soil, 15 were also antagonistic on potato dextrose agar, including *Wojnowicia graminis* [ibid., xii, p. 157 and next abstract], *Plenodomus meliloti* [ibid., xii, p. 635], *Helminthosporium sativum*, *Bacterium translucens* [var.] *undulosum* [ibid., xi, p. 434], *P. chelidonii*, *Botrytis cinerea*, and various bacteria. Of the 45 organisms giving only moderate or no control of *O. graminis* in the soil, 28 unexpectedly proved to be decidedly antagonistic in culture, including another strain of *H. sativum*, *Leptosphaeria herpotrichoides*, *Sclerotinia* sp., *Ascochyta graminicola* [ibid., xi, p. 768], and *P. destruens* [ibid., xi, p. 535]. *Typhula graminum* [ibid., x,

p. 235] gave moderate control of *O. graminis* in the soil and was antagonistic to it on Molisch's medium but compatible on potato dextrose.

Considering the phenomena of compatibility and antagonism in relation to the final hydrogen-ion concentration of the medium in which the organisms were grown, it was found that 11·6 per cent. of the 43 cultures showing antagonism to *O. graminis* on the solid substratum gave P_H values between 3·8 and 5·4, 58·1 per cent. between 6·0 and 7·4, and 7 per cent. between 8·0 and 9·0, the rest being intermediate. Of the 23 compatible cultures, 8·7 per cent. gave values between P_H 3·8 and 5·4, 65·2 per cent. between 6·0 and 7·4, and 13 per cent. between 8·0 and 9·0. Thus, the largest number in both groups had P_H values between 6·0 and 7·4, the optimum range, according to Davis and to Webb and Fellows [ibid., vi, p. 217] for the growth of *O. graminis*. A possible explanation of the seemingly conflicting results with regard to antagonism and compatibility obtained in certain cases is that the various micro-organisms produce metabolic substances differing in kind and in amount according to the substratum. It is in any case unsafe to predict the behaviour of a given organism towards *O. graminis* in the soil from its relations with the fungus in culture.

Foëx (E.) & Rosella (E.). **Quelques observations sur le piétin des céréales.** [Some observations on foot rot of cereals.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 4–5, pp. 172–187, 1933.

In this paper the authors give considerable details of their studies on *Cercosporella herpotrichoides* in the neighbourhood of Paris, the results of which mainly confirmed the observations already communicated in a previous note [*R.A.M.*, xii, p. 560] on the part played by this fungus in the etiology of the foot rots of cereals in that region [ibid., xi, p. 503; xii, p. 157]. It is pointed out that since 1928, of all the organisms involved in these diseases, *Ophiobolus graminis* and *C. herpotrichoides*, and to a certain extent *Wojnowicia graminis*, are the only fungi responsible for serious damage to cereal crops at Versailles and in the vicinity, while *Leptosphaeria herpotrichoides* and *O. herpotrichus* have only been isolated from sheaves that had overwintered in the field. There also was confirmation that although *C. herpotrichoides* is intrinsically a less virulent parasite than *O. graminis*, it usually is more dangerous to the crops, as it generally attacks them early in autumn, continues to develop during mild and wet winters, and its dispersion in the spring is ensured by the formation of abundant conidia.

While for the most part *W. graminis* only attacks weakened plants, it usually accompanies *C. herpotrichoides* and *O. graminis*, and the lesions caused by it are less definitely localized than those of *C. herpotrichoides* to the leaf sheaths and culm bases; it is frequently found also in the root system, but does not cause in it the dark brown discoloration associated with attacks of *O. graminis*. In the south of France and in Morocco it is capable of more serious injury and can cause lodging of the wheat.

KLEMM (M.). **Auswinterungsschäden im Winter 1932/33.** [Winter injury in the winter of 1932–33.]—*Mitt. Deutsch Landw.-Gesellsch.*, xlviii, 23, p. 513, 1 map, 1933.

Cereals in Germany suffered comparatively little from winter injury, chiefly associated with *Fusarium nivale* [*Calonectria graminicola*: *R.A.M.*, xii, pp. 277, 502] during 1932–3, ploughing up over areas of up to 20 per cent. of the total under cereal cultivation being generally necessary only in parts of Hanover, East Prussia, and the Rhine Province.

STOREY (H. H.). **Investigations of the mechanism of the transmission of plant viruses by insect vectors. I.**—*Proc. Roy. Soc.*, London, Ser. B., cxiii, 784, pp. 463–485, 1 pl., 1 fig., 1933.

After a brief reference to his discovery [a short account of which was noticed in *R.A.M.*, x, p. 652, the full paper being published in *Proc. Roy. Soc.*, London, Ser. B., cxii, 774, pp. 46–60, 1932] of 'active' and 'inactive' races of *Cicadulina mbila* in the transmission of maize streak [*R.A.M.*, xi, pp. 66, 591], the author describes in detail a method by which he successfully inoculated the streak virus into a large number of inactive, and active but not infective, individuals of these insects and inactive ones of a second species, *C. zeae*. The inoculum consisted of fresh juice of young diseased maize seedlings; when kept in the dark at 23° C. this fluid retained its infective capacity up to the fourth day after preparation, but was not infective on the eighth day, and it was able to cause the insects to become 'active' (i.e., viruliferous) by heavy inoculation into them when diluted with distilled water by 10^{-2} and rarely by 10^{-3}. Roughly stated, the inoculation itself consisted in the introduction of the virus into a puncture of the abdomen or leg made with a finely pointed needle or glass micro-pipette. During the whole work a single strain of streak, maintained on maize seedlings in the greenhouse, was used and showed no signs of splitting up.

The results showed that of 150 previously non-infective individuals of active *C. mbila* (including both sexes of adults and also nymphs) which were inoculated, a total of 106 transmitted the disease when placed on healthy maize plants. The infections caused by them in short periods of exposure were, however, more irregular that those caused by insects made infective by feeding on a source of the virus (e.g., a diseased leaf), and the disease usually developed in the plant more slowly. Ultimately the inoculated insects became non-infective, whereas the insects which had taken the virus by mouth usually retained their infectivity up to their death. Attempts to render the insects infective by drawing up the virus into the rectum through the anus gave negative results, and it would appear that the lower part of the alimentary canal may retain the virus without causing the insect to be able to transmit the disease.

Inoculations into non-infective active individuals of the fluid obtained from different parts of infective ones showed that in the latter the virus was present (*a*) in the contents of the rectum, if the insect had recently fed on a diseased plant, but not otherwise;

(*b*) in the general contents of the thorax or abdomen; and (*c*) in the blood, whether the insect had fed recently upon diseased or healthy plants. The virus was not found in the naturally voided faeces, and its appearance in the blood preceded the development in the insect of the power to cause infections.

The needle inoculation was also effective in rendering inactive races of *C. mbila* infective, but the proportion of successes was significantly less than with active races. Individuals of these races that had not been inoculated by puncturing were shown to harbour the virus in their rectum after a recent feed on a diseased plant, but never in the blood. A simple puncture of the abdomen by a sterile needle, however, either following or preceding a feed on a diseased plant, sometimes caused inactive individuals to become infective, the indications being that the treatment was effective only if some part of the intestine was punctured by the sterile needle.

The same methods were also successful in rendering inactive races of *C. zeae* infective, but attempts to inoculate the viruses of maize stripe and mosaic into *C. mbila*, or the virus of streak into *Peregrinus maidis* and *Aphis maidis*, all gave negative results.

The results of these investigations lead the author to believe that the streak virus, after absorption by the insect through the mouth, enters the intestine, and in active *C. mbila* races passes from there into the blood through the intestinal wall at some point higher up than the rectum, while in inactive races the intestinal wall is impenetrable to the virus throughout; the latter suggestion is supported by the fact that a rupture in the intestinal wall caused by pressure, allowing the access of the virus to the insect's blood, made many inactive individuals to transmit streak like active insects. It is recognized, however, that there may also exist some secondary mechanism of resistance in the inactive insects.

Bacterial wilt of Corn.—*Plant Disease Reporter*, xvii, 8, pp. 97–98, 1933. [Mimeographed.]

All the available evidence indicates that in 1933 the losses in the United States from bacterial wilt of maize (*Aplanobacter stewarti*) [*R.A.M.*, xii, p. 562] may even exceed those of the previous two years, strains and hybrids previously considered as resistant now showing a relatively high susceptibility.

Observations made in June, 1933, showed that in Hampden County, Massachusetts, almost every field had from 1 to 85 per cent. primary infection, as against a maximum of 1 or 2 per cent. in 1932; in Connecticut 65 per cent. infection was occasionally present; in Pennsylvania infection was general, affecting 70 per cent. of the plants in many fields; and in Ohio a number of fields showed 70 per cent. infection and others had already been ploughed up. The disease was also very severe in Michigan, though not of commercial importance in this State before 1932. In Indiana almost all varieties showed higher percentages of infection than in the year before, and in Illinois different varieties of yellow sweet corn showed 26 to 78 per cent. infection. In Arkansas the disease was recorded for the third time in the last 15 years.

Rand (F. V.) & Cash (Lillian C.). **Bacterial wilt of Corn.**— *U.S. Dept. of Agric. Tech. Bull.* 362, 30 pp., 3 pl., 2 graphs, 1933.

Continuing their studies on bacterial wilt (*Aplanobacter stewarti*) of maize [*R.A.M.*, iv, p. 162] the authors state that the disease occurs primarily in the south and centre of the United States [ibid., xii, p. 281, and preceding abstract], and is rare or non-existent in the most northern States. Although there was clear evidence that it is transmissible through infected seed-grain (the organism was isolated from inside grain from diseased plants at least five months after harvest), and that plants raised in the greenhouse from such seed gave from 2 to 13 per cent. infection, it is considered that transmission by this means is important only in introducing the wilt into new localities. This is supported by the fact that when seed-maize imported from regions where the disease does not occur, was sown in localities where it is prevalent, the ensuing crops exhibited startling amounts of the disease, as high as 96 per cent. in some varieties imported from Maine to Maryland.

In field experiments, from which insects were not precluded, no significant differences were noticed in the amount of wilt developing in plants raised from healthy seed sown in artificially inoculated soil or in non-inoculated soil that had not been in maize for at least two seasons. In field and greenhouse experiments in which the insects were controlled, however, no wilt resulted in inoculated soil, except in a few plants that had been subjected to severe root pruning, followed by immediate inoculation of the soil in contact with the cut roots [ibid., xi, p. 446]. This is interpreted to indicate that although overwintering of *A. stewarti* in the soil may conceivably take place on rare occasions, it is not likely to occur and is of no practical significance in the field. It was further shown that while weather conditions, such as temperature and rainfall, soil moisture, and also the condition of growth of the host, have a considerable influence on infection and the subsequent development of wilt, these factors are often quite overshadowed by dissemination of the organism by insects, among which the brassy and toothed flea beetles (*Chaetocnema pulicaria* and *C. denticulata*) have been definitely shown to be responsible for the main summer spread, at least in Maryland.

Comparative tests of some 60 [named] varieties of maize indicated the existence of wide differences in their relative resistance to wilt, the general trend being for the earlier varieties to be more susceptible than the later maturing ones.

The investigation indicated that in localities where bacterial wilt is prevalent seed-grain disinfection is of doubtful value owing to secondary summer dissemination of the organism. Seed treatment is only of use for the prevention of the introduction of the disease into new areas, and is difficult since the organism is carried inside the grain. Laboratory experiments, however, indicated that subjecting infected seed-grain to dry heat at a temperature well above the thermal death point (53° C.) of *A. stewarti* for a period of time sufficient to allow the heat to reach all the parts of the seed was effective in killing the parasite without materially

reducing the germination of the seed or the vigour of the resulting plant.

[Walters (E. A.).] **Report on the Agricultural Department, St. Lucia, 1932.**—39 pp., 1933.

In the section of this report dealing with plant diseases (pp. 13–14) it is stated that owing to wet weather during the first five months of the year there was some extension of wither-tip of limes (*Gloeosporium limetticolum*) [*R.A.M.*, xi, p. 698] in St. Lucia during 1932. Subsequent wet, cold weather led to an onset of the blossom blight stage in November. As a result of these conditions the crop is expected to show a decrease of 11 per cent. as compared with that of the preceding year.

Scab [*Sporotrichum citri* or *Sphaceloma fawcettii*: ibid., xii, p. 625] of sour orange [*Citrus aurantium* var. *bigaradia*], comparatively unknown before 1931, has now become one of the most troublesome diseases in nursery work, its spread having been facilitated by the accumulation of a large number of stocks in the nurseries; spraying and handpicking were carried out systematically and were effective when drier weather prevailed. At present only nurseries on the heavier soil are affected.

Jenkins (Anna E.). **A Sphaceloma attacking Navel Orange from Brazil.**—*Phytopath.*, xxiii, 6, pp. 538–545, 1 fig., 1933.

Bahia Navel oranges (*Citrus sinensis*) in São Paulo, Brazil, are stated to be severely attacked by a variety (*viscosa*) of *Sphaceloma fawcettii* [see preceding abstract] characterized by an abundant viscid growth on wort-agar cultures, ranging from buffy citrine through buffy olive to medal bronze (Ridgway). The acervuli on orange rind are dark-coloured (nearly old gold in section), about 40 μ across, the 0- to 3-septate conidiophores measure 6 to 18 by 4 to 5 μ, and the conidia 6 by 4 μ; hyaline conidia of similar dimensions are produced in culture. On potato-dextrose agar the navel orange scab fungus differs from the type in its light orange-yellow coloration as well as by the above-mentioned viscid secretion. In its temperature relations, however, *S. fawcettii* var. *viscosa* agrees closely with cultures of the type species originating in the United States, Australia, South Africa, and Formosa from several kinds of citrus (not including the *C. sinensis* group). Specimens of the type of scab on sweet orange described by G. L. Fawcett from the Argentine [ibid., x, p. 654] resembled the navel orange scab more closely than the usual form of *S. fawcettii*. Navel orange scab appears to be confined to the fruit, which is frequently rendered unmarketable by the disease.

Park (M.). **Citrus mildew.**—*Trop. Agriculturist*, lxxx, 5, pp. 321–322, 1 col. pl., 1933.

In the wetter areas of Ceylon the mildew *Oidium tingitaninum* is very common on the leaves of several species and varieties of *Citrus*, a list of which is given [*R.A.M.*, xii, p. 166].

The disease usually appears in small isolated spots, on which the fungus forms fine radiating lines, on the edges of the young leaves. In damp weather the succulent young shoots also become

covered with the mildew. The diseased leaf surface darkens and generally is depressed, and the youngest leaves shrivel and fall, leaving the bare, green twig, which dies back; the young growth of orange-trees is sometimes completely destroyed in this way. As a rule, however, some irregularly buckled, distorted, larger leaves remain. The spores are disseminated by wind or rain.

Complete control is given by two or three applications of a sulphur spray [loc. cit.] during the growing period. Dead and dying shoots and branches should be pruned off, and young suckers should not be allowed to grow up from the bottom of the tree. Severely affected shoots should be removed and burnt.

Fawcett (H. S.), Klotz (L. J.), & Haas (A. R. C.). **Water spot and water rot of Citrus fruits.**—*California Citrograph*, xviii, 6, pp. 165 and 175, 4 figs., 1933.

Considerable losses (averaging one year 40 per cent. of the crop) are stated to have been caused to navel oranges in the east of Los Angeles county and other districts of California, by a serious rind break-down (for which the descriptive name 'water spot' is suggested), first seen in 1927, with severe recurrences in 1929, 1930, 1932, and 1933, following more or less prolonged rainy periods in the early spring. Unless checked by the onset of dry weather, the condition is usually followed by a soft rot of the whole orange due to secondary fungi. Experiments and field observations indicated that the trouble, which mainly affects nearly ripe oranges on the tree, is due to imbibition of water through weak spots and slight injuries in the rind caused by various agencies, most of which are not controllable, though some may be minimized by adequate precautions in spraying and fumigating the trees. The condition was experimentally reproduced in mature Valencia oranges and lemons by soaking them for 36 hours in distilled water.

Quayle (H. J.). **Bordeaux spraying and fumigation injury.**—*California Citrograph*, xviii, 6, pp. 166 and 184, 1933.

The author states that the results of experiments in 1932 with lemon seedlings in pots and various citrus trees in the field showed that injury to the trees from cyanide fumigation following Bordeaux mixture ensued even on those plants which had been sprayed with the neutral or approximately neutral (4-0·8-50) Bordeaux mixture recommended by Butler and Jenkins [*R.A.M.*, ix, p. 732], although it was markedly less than on those that had been treated with the normal (4-4-50) formula. Further experiments showed that citrus trees that had received 3 or 5 lb. applications of copper sulphate on the ground around them (as used in treating exanthema) two and three years previously, suffered heavy defoliation when fumigated, while controls remained uninjured. Tests with other copper compounds, including copper carbonate and copper acetate, showed that these were also injurious on fumigation, although the injury was less than with copper sulphate. These results indicate the desirability of finding a substitute for copper in the treatment of citrus groves against brown rot [*Phytophthora citrophthora*], and work is in progress to establish the efficacy in

the field of a zinc sulphate-lime spray (4–4–50), which has been reported by Fawcett to check the brown rot quite satisfactorily in the laboratory.

La frisolée foliaire du Caféier. [Leaf crinkle of the Coffee tree.] —*Rev. Agrol. et Bot. du Kivu, 1933*, 2, p. 24, 1933.

Attention is drawn to the occurrence of a leaf crinkle in the Kivu [Belgian Congo] coffee plantations. The disturbance is attributed to physiological causes—drying winds and abrupt alternations of day and night temperature—rather than to parasitic agency or to a virus. The establishment of windbreaks and of shade is indicated.

Moore (Elizabeth J.). **Growth relations in culture of the Cotton-root-rot organism, Phymatotrichum omnivorum.**—*Phytopath.*, xxiii, 6, pp. 525–537, 2 graphs, 1933.

The writer's laboratory experiments [the results of which are fully discussed and tabulated] at Texas University showed that a given culture of the cotton root rot organism (*Phymatotrichum omnivorum*) [*R.A.M.*, xii, p. 628] grows at a fairly constant rate on potato-dextrose agar but that different isolations varied considerably, one recently isolated, for instance, averaging nearly three times the rate maintained by two others that had been kept for long periods on artificial media. On addition to potato-dextrose agar cotton-root extracts greatly accelerated the rate of elongation of the hyphae. On the other hand, freshly prepared maize root extracts, either alone or combined with potato-dextrose agar, proved strongly toxic to all the strains of *P. omnivorum* tested. Such water-soluble substances present in maize roots are labile but show a diminished toxicity on ageing. Small doses of the toxin appear to stimulate the growth of the fungus. A similar toxic effect was exerted in varying degrees by extracts from the roots of *Malva-viscus conzattii* (the only species of Malvaceae known to be highly resistant to *P. omnivora*) [ibid., xi, p. 640], wheat, and barley. It is considered, therefore, that the water-soluble, labile substances present in the roots of plants immune from infection by *P. omnivorum* play a part in the establishment of this condition.

Stovall (W. D.) & Bubolz (Anna A.). **Yeast-like fungi.**—*Journ. Lab. & Clin. Med.*, xviii, 9, pp. 890–902, 7 figs., 1933.

A review is given of the literature on the classification of yeast-like fungi, attention being drawn to the confusion that has led to a multiplicity of species of *Monilia* and resulted in the grouping of all yeast-like organisms as *Blastomyces* [cf. *R.A.M.*, viii, p. 103 *et passim*].

The characteristic differences of certain of these types of fungi are described. Such differences were found to be typical of the various species and to persist through periods of many years under controlled conditions in artificial cultivation.

Brief clinical reports are given of some cases of infection by *Monilia* [*Candida*] spp., which sometimes appear to be responsible for asthma [see next abstract]. These organisms further seem to

be associated with lesions in various parts of the body, *M. candida* [*C. vulgaris*: ibid., xi, p. 373], for instance, being found connected with thrush in one patient and with vaginitis in another [ibid., xii, p. 370]. Careful clinical and laboratory studies established yeast-like fungi as the primary etiologic agents in certain cases of pulmonary, vaginal, and buccal mucous membrane inflammation.

MARETT (P. J.). **Monilia infection of the respiratory tract.**—*Brit. Med. Journ.*, *1933*, 3777, p. 917, 1933.

The examination during 1932 of the sputa of 568 patients in Jersey (Channel Islands) both by direct and cultural methods showed that tuberculosis was present in 103, *Monilia* [*Candida*] in 294, the remaining 171 being free from either [cf. *R.A.M.*, xi, p. 715]. Details are given of the author's cultural and staining work on the species of *Candida* thus isolated. In the air passages infection by *Candida* results either in ulceration, haemorrhage, and bronchiectasis, or in occlusion and collapse of the alveoli at the distal end of the bronchioles, with consequent cavitation, manifested by 'fluffing' of the lung tissue on X-ray examination. These conditions are often found in combination.

The allergic symptoms of moniliasis resemble those associated with analogous diseases, such as hay fever, asthma and bronchiectasis, and tuberculosis, and it is suggested that the acid-fast substance found in the associated organisms in all these diseases is the 'foreign protein' common to all and the inciting cause of the various allergic reactions known to occur in them.

HALER (D. H.). **Monilia infection of respiratory tract.**—*Brit. Med. Journ.*, *1933*, 3781, p. 1130, 1933.

P. J. Marett's claim that *Monilia* [*Candida*] is of primary importance in the causation of pulmonary disease [see preceding abstracts] cannot be accepted by the writer in view of the high incidence of this group of organisms in the respiratory tract of apparently normal persons. Unquestionably these fungi may gain access to the bronchi in cases of subnormal health of the mucosa, but here their action is obviously secondary.

STILES (G. W.), SHAHAN (M. S.), & DAVIS (C. L.). **Coccidioidal granuloma in cattle in Colorado.**—*Journ. Amer. Veter. Med. Assoc.*, lxxxii (N.S., xxxv), 6, pp. 928–930, 1933.

Coccidioides [? *immitis*: *R.A.M.*, xii, p. 288] was isolated from a lymph node of a heifer at Denver, Colorado, in 1931, this being apparently the first record of coccidioidal granuloma in animals outside California. The diseased gland was enlarged and contained several encapsulated areas 3 to 8 mm. in diameter. The tissue was traversed by numerous trabeculous striations giving a honeycomb appearance to the surface of the section. The organism appeared in the form of spherical, double-contoured bodies, 10 to 40 μ in diameter, with a granular protoplasm; some of the larger individuals contained small spheres suggestive of daughter cells. The fungus grew well on meat infusion agar and other standard media and produced positive results on inoculation into guinea-pigs.

Dessy (G.). **La chimiothérapie des mycoses. IIIème Partie: Mucoro-mycose. Ière Communication: expériences 'in vitro'.** [The chemicotherapy of mycoses. Third Part: Mucor-mycosis. First communication: experiments '*in vitro*'.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, v, 4, pp. 95–107, 1933.

In this series of experiments [cf. *R.A.M.*, xi, p. 715] the author tested the growth-inhibitory and fungicidal power *in vitro* on *Mucor mucedo*, *M. pusillus*, *M. roseum*, *M.* sp. (Calmette) and *M.* sp. (Boidin), of 51 colouring agents and 22 metallic salts. The growth in culture of all the organisms was inhibited by brilliant green (1 in 40,000), malachite green (1 in 40,000), and crystal violet (1 in 10,000 to 1 in 500 according to the species). Dahlia (1 in 5,000 to 1 in 500) and gentian violet (1 in 10,000 to 1 in 2,000) prevented the growth of all except *M. roseum* and *M.* sp. (Calmette), while methylene violet and methyl violet (1 in 10,000 to 1 in 500) were inhibitory to all but *M.* sp. (Calmette). The most effective metallic salts were copper sulphate (1 in 2,000), copper chloride (1 in 2,000 to 1 in 1,000), copper acetate (1 in 1,000 to 1 in 500), zinc sulphate (1 in 1,000 to 1 in 500), zinc acetate (1 in 2,000 to 1 in 500), nickel sulphate (1 in 10,000 to 1 in 2,000), nickel chloride (1 in 10,000 to 1 in 2,000), cobalt chloride and nitrate (1 in 10,000 to 1 in 2,000), cadmium chloride (1 in 2,000 to 1 in 1,000), cadmium sulphate (1 in 1,000 to 1 in 500), cerium nitrate (1 in 1,000 to 1 in 500), mercuric chloride (1 in 2,000), and mercury cyanide (1 in 10,000 to 1 in 2,000). All the above-mentioned dyes, except malachite green, were shown to have a fairly strong fungicidal power (as distinct from their inhibitory action) on the organisms, while among the metallic salts those of mercury and copper were the most fungicidal.

Davidson (A. M.) & Gregory (P. H.). **Development of fuseaux, aleuriospores, and spirals on detached hairs infected by ringworm fungi.**—*Nature*, cxxxi, 3319, pp. 836–837, 1 fig., 1933.

When human hairs infected by *Trichophyton gypseum* [*R.A.M.*, xii, p. 218] were exposed in van Tieghem cells to various degrees of humidity controlled by solutions of known osmotic pressure, the chlamydospores germinated rapidly, each hair slowly becoming surrounded by a fringe of mycelium. The ends of many of the hyphae thickened and formed macroconidia ('fuseaux'), which increased in size and numbers until a halo was produced round the hair. Conidia (aleuriospores) and spirals were also formed under the same conditions, and similar tests with *M. audouini* and *M. felineum* have yielded identical results. It is evident, therefore, that the ringworm fungi present in naturally infected hairs may, under suitable conditions of humidity, develop organs hitherto found only in artificial cultures. Cast-off hairs and epidermal scales may well provide a suitable substratum for the saprophytic existence of these fungi and enable them to produce spores capable of infecting new human and animal hosts.

Muskatblit (E.) & Ouspensky (B.). **Influence of grenz rays on pathogenic fungi in skin material.**—*Arch. of Dermatol.*, xxvii, 6, pp. 953–955, 1933.

Hairs containing pathogenic fungi were taken from children with tinea capitis and exposed to grenz rays, the viability of the organisms being subsequently tested by planting the treated hairs on a culture medium.

In doses up to 50,000 roentgens, i.e., over 70 times larger than the average single dose used in the treatment of fungous diseases of the skin, the grenz rays failed to influence the growth of *Microsporon audouini*, *M. lanosum*, *Achorion schoenleini*, and *Trichophyton crateriforme* [*R.A.M.*, xii, p. 443]. *T. violaceum*, however, completely succumbed to exposure to 50,000 roentgens in two tests and was temporarily inactivated at this strength in a third.

The therapeutic effects of grenz rays in dermatomycoses would thus seem to be due to the changed properties and reaction of the skin rather than to direct inhibitive action on the fungi.

Jausion (H.) & Dufestel (L.). **Sur l'action vaccinante de lysats pancréatiniques et diastasiques de dermatophytes.** [On the vaccinating action of the pancreatinic and diastatic lysins of dermatophytes.]—*Comptes rendus Soc. de Biol.*, xciii, 24, pp. 868–870, 1933.

Twenty strains of *Epidermophyton floccosum* [*R.A.M.*, xii, p. 630] and ten of *Achorion schoenleini*, cultured for four months on honey agar, were subjected separately to the enzymatic action of (1) pancreatin, containing trypsin and amylase; and (2) diastase of sprouted barley containing amylase and dextrinase. After ten hours in the autoclave at 55° C. and 30 minutes at 100°, filtration, clarification, and adjustment to an appropriate hydrogen-ion concentration (P_H 7·2), the extracts were used for treating human dermatomycoses. One case of favus and six of inguinal epidermophytosis were successfully treated by 12 injections in a period of one month, using the diastatic and pancreatinic extracts of *A. schoenleini* in the first and those of *E. floccosum* in the others. Similar experiments with other dermatophytes are in progress.

Ota (M.) & Kawatsuré (S.). **Sur l'inoculabilité à l'animal du Trichophyton interdigitale Priestley.** [Note on the inoculability into animals of *Trichophyton interdigitale* Priestley.]—*Ann. de Parasitol. Humaine et Comp.*, xi, 3, pp. 206–221, 1 pl., 1933.

Details are given of experiments in which the authors succeeded in inoculating five strains of *Trichophyton interdigitale* isolated from man to guinea-pigs, in which they caused a distinct, if weak infection of the hairs. These results dispose of the only reason (un-inoculability into animals) for separating this fungus from the collective species *Ctenomyces mentagrophytes* suggested by Langeron and Milochevitch [*R.A.M.*, x, p. 243] (to include this organism together with *T. asteroides*, *T. granulosum*, and *T. radiolatum*), which is accepted by the authors; they consider, however, that until the formation of ascospores and perithecia is definitely proved in these fungi, they ought to be retained among the Hyphomycetes,

and should be known under the name *Sabouraudites mentagrophytes*, in which *T. lacticolor* should also be included, as the characters distinguishing it from *T. asteroides* are very slight.

The authors also claim to have established that *T. radians*, *T. denticulatum*, and *T. pedis* are one and the same species, and consider that they could be conveniently reunited with, and known under, the name of *T. niveum*, a name which is preferred to *T. felineum* Blanchard because of the danger of confusion between the latter and *Microsporon felineum* (*Sabouraudites felineus*).

Negroni (P.). **Onycomycose par Cephalosporium spinosum n. sp. Negroni, 1933.** [Onychomycosis caused by *Cephalosporium spinosum* n. sp. Negroni, 1933.]—*Comptes rendus Soc. de Biol.*, cxiii, 21, pp. 478–480, 1933.

Cephalosporium spinosum n. sp., isolated in the Argentine from discoloured areas on the toe-nails, is characterized on Czapek's medium by greyish-white colonies with reddish-purple zones, sterile rampant hyphae forming spines of interlaced, very slender, hyaline, branched, septate, filaments, 1·5 to 2 μ in diameter; simple conidiophores, 27 to 28 by 1·3 to 1·5 μ, tapering at the apices; and oval or elliptical, hyaline, smooth spores, 4·89 by 3·26 μ. borne at the tips of the conidiophores in conglomerate heads united by a mucous substance. The optimum temperature for the development of the fungus is about 28° C. Details are given of its development on Sabouraud's and Raulin's media.

Riess (G.) & Ludorff (W.). **Ausländische gesetzliche Bestimmungen über die chemische Konservierung von Lebensmitteln.** [Foreign legal regulations concerning the chemical preservation of foods]—*Arb. aus dem Reichsgesundheitsamte*, lxvi, 1, pp. 119–164, 1933.

A summary is given of existing legislation on food preservation in countries outside Germany, showing the maximum amounts permissible of the various chemicals employed for this purpose, e.g., sulphuric, salicylic, and benzoic acids [*R.A.M.*, xii, p. 524].

Olson (H. C.) & Hammer (B. W.). **Bacteriology of butter. V. Studies on the micro-organisms in churns.**—*Iowa Agric. Exper. Stat. Res. Bull.* 159, 120 pp., 10 figs., 2 graphs, 1933.

The results of the investigation reported in detail in this communication showed that the microbiological condition of the churns in commercial use is of considerable importance as a source of contamination of butter with bacteria, yeasts, and moulds [cf. *R.A.M.*, xii, p. 219], as evidenced by the fact that fresh unsalted butter from contaminated churns was found to contain an average of 277,700 bacteria, 8·2 yeasts, and 1·3 moulds per c.c., while the corresponding numbers for similar butter from clean churns were 21,740, 1·4, and 0·6, respectively. The average bacterial count of cream pasteurized at 145° F. was 336,500, while that pasteurized at 155° had 60,300 per c.c.; the former sometimes contained significant numbers of yeasts and moulds, while in the latter these organisms were practically eliminated. The paper also gives

details of experiments on different methods for the control of the micro-organisms in the churns.

Morgan (G. F. V.) & Moir (G. M.). **Discoloration in New Zealand Cheddar cheese. Muddy, pink and bleached defects. I. Bacteriological investigations. II. Biochemical investigations.** —*Journ. Dairy Res.*, iv, 2, pp. 226–245, 2 figs., 1933.

The evidence of high P_H and high catalase activity confirmed the view that mould (*Penicillium puberulum*) growth is closely associated with the development of the 'bleached', 'pink', and 'muddy' types of discoloration in New Zealand Cheddar cheese, which are stated to be responsible for heavy losses amounting to hundreds of pounds per annum. The pink discoloration appears to result from the action of acids on the annatto colour, bleaching from a reduction process involving changes in the fat, and the muddy or dark tinge from enzymes (possibly including tyrosinase) diffusing into the cheese from centres of mould growth.

Parsons (B.) & Massey (L. M.). **Rose-disease investigations. Fourth progress report.**—*Amer. Rose Ann.*, *1933*, pp. 87–101, 1933.

Continuing their field trials in Pennsylvania on the control of rose diseases [*R.A.M.*, xii, p. 25], the writers found that black spot (*Diplocarpon rosae*) [ibid., xii, p. 570] was best combated by the sulphur dusts kolotex, pomodust, manganar, and kolodust, and (though somewhat less effectively) by Bordeaux mixture and by flotation sulphur [see below, p. 708]. Less satisfactory results were given by lime-sulphur and various wettable sulphur sprays without lead arsenate. Brown canker (*Diaporthe umbrina*) [ibid., xii, p. 25] yielded to the same treatments as black spot, but neither disease was very severe during the fourth season of the tests, and the incidence of mildew (*Sphaerotheca pannosa*) was negligible.

White (R. P.). **The insects and diseases of Rhododendron and Azalea.**—*Journ. Econ. Entom.*, xxvi, 3, pp. 631–640, 2 pl., 1933.

Semi-popular notes are given on the symptoms and control of the following diseases affecting rhododendrons and azaleas in the United States: leaf spots caused by *Cercospora rhododendri* [*R.A.M.*, vi, p. 258] and *Puccinastrum minimum* [*Thecopsora minima*] (both on *Rhododendron ponticum*); *Melampsoropsis piperiana* on *R. californicum*; *Exobasidium vaccinii* on various species; *E. oxycocci* [ibid., x, p. 532; xi, p. 188] on *R. maximum* and *R. catawbiense*; *Phyllosticta saccardoi*, *P. maximi* [ibid., xi, p. 518], and *Phomopsis* sp. (the latter causing a leaf spot and canker) on *R. maximum*; *Lophodermium rhododendri* on the same and *R. californicum*; mosaic [ibid., xi, p. 244] on *R. ponticum* and hybrids; *Septoria azaleae* [ibid., x, p. 734], leaf and stem spots (*Pestalozzia macrotricha* and *P. rhododendri*) [ibid., ix, p. 389; x, p. 798], blights (*Phytophthora cactorum* [ibid., ix, p. 390] and *Botrytis* sp.), root rot (*Armillaria mellea*), bud blast (*Sporocybe azaleae*), and root rot and wilt (*P. cinnamomi*) [ibid., xi, pp. 356, 626] on various species; damping-off and basal canker (*Rhizoctonia*

[*Corticium*] *solani*) on *R. ponticum* and *R. carolineanum*; and slime mould (*Physarum cinereum*), causing the death of seedlings by suffocation.

BRIERLEY (P.). **Studies on mosaic and related diseases of Dahlia.** *Contrib. Boyce Thompson Inst.*, v, 2, pp. 235–288, 12 figs., 1 graph, 3 diags., 1933.

This is the full report of the author's investigation of mosaic and related diseases of dahlia, a brief abstract from which has already been noticed [*R.A.M.*, xii, p. 374]. In addition to the information previously given, it is stated that the term 'dahlia stunt' [ibid., x, p. 83] is not synonymous with mosaic, as it covers, besides some of the more pronounced mosaic symptoms in varieties less tolerant of this disease, also certain insect injuries. The severity of mosaic symptoms depends largely on the tolerance of the variety affected, ranging from simple veinbanding (the most constant and characteristic symptom) in the more tolerant varieties, to leaf distortions, shortening of the internodes and flower stalks, vein necrosis, and a tendency towards tuber stunting, in the more intolerant ones.

The infective principle of mosaic was shown to be present and to persist in all the vegetative parts of the affected plants, but not in the seed; its transmissibility by grafting but not by mechanical methods (all of which have proved so far to be ineffective) was demonstrated by experiments which also indicated that the various symptoms exhibited by tolerant and intolerant dahlia varieties are only varietal reactions to a single virus entity. Further experiments showed the aphid *Myzus persicae* to be a vector of mosaic, but gave no clear evidence that any of the other insects tested are implicated in its dissemination. While all of the members of the genus *Dahlia* so far tested are susceptible, no suscepts have been found outside this genus.

Limited field observations indicate that some infections through *M. persicae* take place in July, and that more occur in September and October. In the vicinity of New York the number of new infections in plots containing a considerable number of infected plants ranged from 10 to 25 per cent. per annum. The expression of the symptoms is often delayed in early season growth, and the chlorotic symptoms are frequently masked during the season, this effect being presumably determined by growth relations rather than by any single environmental factor. It is suggested that the disease may be controlled by selection and isolation of disease-free plants, supplemented by suppression of aphids in the greenhouse and roguing out of diseased plants. Tolerant, mosaic-infected varieties should be kept separate from healthy stocks.

The paper also includes some notes on three other virus diseases of dahlias, namely, ring-spot, yellow ring spot, and oak-leaf [ibid., xii, p. 374]. Ring spot is generally distributed in Connecticut, New Jersey, and southern New York, although it was found in high percentages in only a few localities. It commonly accompanies mosaic and is characterized by irregular concentric rings, irregular zigzag markings, intricate hieroglyphic patterns, and green patterns, the colour of the chlorotic areas varying from pale

green to yellowish-green in different varieties. The symptoms may either disappear or become suppressed in subsequent years and partial infection of the vegetative parts appears to be not uncommon. This disease was experimentally transmitted by grafting but not by mechanical methods, and when *M. persicae* aphids were fed on plants exhibiting both ring spot and mosaic symptoms, the latter disease alone was transmitted by the insects to healthy plants. The bright yellow variety of this disease was seen for the first time in 1931 in Utah, and was also shown to be transmissible by grafting but not by mechanical means. The oak-leaf pattern is tentatively attributed to a virus solely on the basis of the symptoms expressed (in the varieties Calvin Coolidge, Jr., and Catherine Wilcox) since it was only recognized in 1932 and there has been little opportunity to test its transmission. Leaf-like markings and sometimes poorly defined large chlorotic rings appear on the leaves, but there is no dwarfing or necrosis.

None of these four virus diseases has so far been connected with any other known virus disease.

Diehl (W. W.). **Exobasidium monosporum on Camellia.**—*Plant Disease Reporter*, xvii, 5, p. 44, 1933.

Leaves and twigs of *Camellia sasanqua* from Alabama were found to be seriously affected by a disease characterized by the development of a whitish bloom apparently due to *Exobasidium monosporum*, reported by Sawada as parasitic on *Gordonia* in Formosa (*Rept. Dept. Agric. Govt. Res. Inst. Formosa* 2, p. 108, 5 pl., 5 figs., 1922: Japanese). The fungus is characterized by the presence of only one spore on each basidium and is thus unique among the known American species of *Exobasidium*. *Camellia* has apparently not hitherto been recorded as a host of *E. monosporum*.

Williams (P. H.). **Leafy gall of the Chrysanthemum.**—*Eighteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1932*, pp. 32–39, 1933.

A condition known as 'leafy gall' which has affected chrysanthemums in the vicinity of Cheshunt for some years is stated recently to have become serious. Whereas in the healthy plant shoots are sent up from the base and are used for cuttings, in affected plants the shoots branch repeatedly, a thick mass of short shoots with small, distorted leaves being formed; sometimes the affected shoot instead of branching becomes thickened and bears fleshy leaves. The galls, most of which develop about December, soon die when the plants are cut down at the end of the season. Phyllis Cooper was the most susceptible variety, with 77·7 per cent. affected pots, Mary Morris showed 28·5 per cent., and Cheshunt White was the most resistant, with only 2·1 per cent. of infected pots.

Isolations of bacteria from affected material on Patel's bile salt agar [*R.A.M.*, vi, p. 19] were grown on numerous media and compared with others from a normal crown gall growing under soil level on a young chrysanthemum shoot, as well as with a pure culture of *Bacterium tumefaciens*; the morphological and physio-

logical characters [which are described] indicated that all were strains of *Bact. tumefaciens*. Pathogenicity tests resulted in the production of leafy galls in five out of 18 plants inoculated by pouring liquid cultures of the leafy gall strain on the soil, while stem inoculations by pricking caused slight swellings, unlike the definite galls produced by the other strains. Similar inoculations on stems of tomato, pelargonium, and *Tropaeolum* gave rise to more or less slight swellings with the leafy gall strain, which showed much less virulence than the other two.

Some preliminary experiments in the control of leafy gall by soil sterilization are briefly described.

Brown (J. N.), Savage (A.), & Robinson (A. D.). **A report of some investigations into the cause of Sweet Clover (Melilotus) disease.**—*Scient. Agric.*, xiii, 9, pp. 561–565, 1933. [French summary on p. 607.]

The results of experiments [details of which are given] with live cattle and rabbits showed that an intensive diet for 188 days of relatively mould-free sweet clover (*Melilotus*) [*alba*] did not cause in heifers any of the pathological symptoms associated with the serious disease, frequently ending in death, which is stated to be prevalent in Manitoba in cattle fed with sweet clover hay. No clinical symptoms ensued after 77 days' feeding of the heifers on sweet clover hay which was artificially inoculated with *Penicillium brevicaule* isolated from a lot of heavily moulded hay that had proved toxic to cattle on a Manitoba farm. The disease was reproduced, however, with lethal issue in one case, when four heifers were fed for 42 days on a relatively mould-free sweet clover hay (in which *P. brevicaule* was not found) which had also caused mortality in cattle, and which was of a dark brown colour and had a sweetish tobacco-like odour; these two characters seem to be typical of sweet clover possessed of disease-producing qualities. Tests with rabbits indicated that the toxic substance of such hay is not water-soluble, and the experiments do not support the prevalent opinion that only mould-damaged sweet clover causes the disease in question.

Crosby (C. R.), Mills (W. D.), & Blauvelt (W. E.). **Protecting orchard crops from diseases and insects.**—*Cornell Agric. Exper. Stat. Bull.* 498, 82 pp., 18 figs., 1 diag., 1933.

This is a revision, stated to incorporate considerable additional information and practical suggestions, of the bulletin issued by the same writers in 1929 on the control of orchard diseases and pests by spraying and dusting in New York State [*R.A.M.*, ix, p. 459]. Schedules are given for the combined control of the chief insect pests and fungous diseases of each of the pome and stone fruits grown in the State, with special modifications when necessary to deal with severe attacks of the less common organisms.

Rosen (H. R.). **Further studies on the overwintering and dissemination of the fireblight pathogen.**—*Arkansas Agric. Exper. Stat. Bull.* 283, 102 pp., 27 figs., 3 graphs, 1933.

The author gives considerable details of his continued researches

on the modes of overwintering and of dissemination in the spring in Arkansas of fireblight (*Erwinia amylovora*) [*Bacillus amylovorus*: *R.A.M.*, ix, p. 189]. Field observations and laboratory experiments showed that out of a grand total of some 60,000 infected apple and pear twigs and limbs examined from 1929 to 1932 in February, March, and April (i.e., prior to the appearance of new season infections in the field), not more than 25 bore bacterial ooze containing *B. amylovorus*; the ooze present on the remainder was either sterile or only contained saprophytic species of bacteria. A careful survey in the early spring of the three years revealed many instances in which no correlation could be established between the amount of the disease in a given year in the orchards, and the presence or absence of the trouble in them during the preceding season. In 1930, in particular, in many cases fireblight was found in considerable quantities in well-isolated orchards that were free from the disease in 1929 and which appeared to be out of reach of rain-driven inoculum. It was observed that while atmospheric precipitations in the early spring probably are at times an important factor in Arkansas in the distribution of *B. amylovorus*, in 1930, when blossom blight of apples was extremely prevalent and destructive, no rains fell throughout the blossoming period. This observation, together with other studies, lead the author to consider that in 1930, at least, pollinating insects and not rainfall were in a large measure responsible for the blossom blight, this view being supported by the fact that in studying the sequence in the development of fireblight within any one season, blossoms of both pears and apples were found to be the first organs to show signs of infections.

Artificial inoculations both in the field and in the greenhouse showed that, at the time of blossom production, the young leaves whether in the blossom cluster or arising from vegetative buds are fully as susceptible to infection as the floral tissues, and that infections on flowers and leaves are readily obtainable in the absence of wounds or of insects, provided the inoculum is applied as a water spray simulating ordinary precipitation or rain driven by wind. When the earliest symptoms of infection were not complicated by frost injury, fireblight usually appeared in the upper parts of the flowers, suggesting distribution of the parasite by blossom-visiting agents, but when frosts cause the early flowers to fall the disease appears simultaneously on blossoms and leafy shoots.

A study of twig blight of pears and apples indicated that while much of it is secondary and is directly or indirectly connected with blossom blight, there is a second type of primary nature, which may originate in four different ways: (*a*) as internal extensions of the previous year's lesions, usually appearing shortly after the first symptoms of blossom blight; (*b*) as bud infections in which the buds, though infected the previous year by internal extension, remain alive through the winter; (*c*) as infections resulting from bacterial exudates produced in the previous season; and (*d*) as twig blight caused by inoculum from overwintered cankers, a form which does not ordinarily appear in Arkansas until late May or June. Evidence was also obtained that under natural conditions twig blight originates mainly from direct in-

fections on the stems rather than through leaves, entrance apparently being effected in some instances through the stomata, often through those located in the axils of the leaves. There were indications, however, that mechanical wounds are even more important than the stomata as ports of entry for the organism.

Considerable details are also given of the investigations concerning the distribution of fireblight by honey bees and other insects, confirming the oversummering and overwintering of the pathogen in some beehives [ibid., x, p. 111], and the paper terminates with a discussion of preliminary experiments on the control of the blossom blight stage of the disease, a brief report of which has already been noticed from another source [ibid., xii, p. 225].

Mix (A. J.). **Factors affecting the sporulation of Phyllosticta solitaria in artificial culture.**—*Phytopath.*, xxiii, 6, pp. 503–524, 1 fig., 1933.

In the writer's laboratory studies at Kansas University, the apple blotch fungus (*Phyllosticta solitaria*) produced pycnidia and spores [*R.A.M.*, xi, p. 583] on a variety of media, especially potato-dextrose and apple bark decoction agar, the former at one-tenth the usual strength and the latter at one-fifth. No effect is exercised on the sporulation of *P. solitaria* in culture by light or darkness, the locality of origin of the fungus, the portion of the host from which it is isolated, or the time of year when the cultures are made. A modified Coons's medium has also given good results, the composition being as follows: 0·5 gm. KNO_3, 1·25 gm. KH_2PO_4, 0·75 gm. $MgSO_4$, 0·10 gm. dextrose, 20 gm. agar, and 1,000 c.c. water. The best source of nitrogen was found to be potassium nitrate, followed by albumen, while asparagin and peptone were less favourable. Dextrose, levulose, mannose, and sucrose were equally valuable as sources of carbon.

On the modified Coons's medium the fungus produced fertile pycnidia at an initial hydrogen-ion range from P_H 4·2 to 5·8. The minimum, optimum, and maximum temperatures for growth in culture were from 8° to 12°, 26° to 29°, and 33° to 35° C., respectively, and for sporulation the optimum ranged from 22° to 29°.

Non-sporulating strains of *P. solitaria* were isolated in some cases and also arose from the sporulating strains by mutation. Autolysis of the mycelium and spores occurs in old cultures (upwards of a fortnight).

McLarty (H. R.). **Perennial canker of Apple trees.**—*Canadian Journ. of Res.*, viii, 5, pp. 492–507, 2 pl., 1 fig., 1933.

Further studies on the perennial canker of apple trees (*Gloeosporium perennans*) in the Okanagan district of British Columbia [*R.A.M.*, xi, p. 248; xii, p. 299] have indicated that the association of three factors is necessary to induce the occurrence of the disease, namely, infection of the tissues by the fungus; annual late summer and autumn invasion of the callus tissue by the woolly aphis (*Schizoneura* [*Eriosoma*] *lanigera*); and the exposure of the trees to periods of low temperatures during the winter. Various other influences further the development of perennial canker, including heavy precipitation, early pruning (in November or December),

and the cultivation of susceptible varieties, such as Spitzenberg, Yellow Newtown, Rome Beauty, and Jonathan.

Discussing separately each of the three primary factors in the causation of perennial canker, the writer emphasizes the importance of the saprophytic phase in the life-cycle of the fungus, which ensures its perpetuation quite independently of parasitic action; the latter, in fact, is definitely limited to one season under natural conditions, though artificial inoculations of the xylem are successful at almost any time. The fungus is incapable by itself of reviving old infections, and it further seems clear that no new infection can arise in the canker from the germination of spores on the surface of the callus. Canker formation, therefore, is dependent on a series of successive inoculations into the callus tissue, a process readily effected during the late summer and autumn through the feeding activities of the woolly aphids. In a protracted experiment conducted in two districts on two varieties, involving the treatment of over 400 cankers, no case of new infection was observed in any canker from which the insects were excluded, whereas in all except two of those harbouring aphids fresh infection took place. The host tissues are brought into a suitable physiological condition for invasion by *G. perennans* by lengthy exposure to low temperatures, resulting in the subsequent enlargement of the cankers in the late winter and early spring. In the absence of any one of these three factors perennial canker fails to develop.

From an economic standpoint the present control measures against perennial canker are scarcely satisfactory, the removal of dead bark from the cankers being a tedious operation and the cost of aphid eradication prohibitive.

KATSER (ANNIE). **Ueber die Resistenz verschiedener Apfelsorten gegenüber Sclerotinia fructigena (Pers.) Schroet. und ihre Beziehung zur Wasserstoffionenkonzentration.** [On the resistance of different Apple varieties to *Sclerotinia fructigena* (Pers.) Schroet. and its relation to the hydrogen-ion concentration.]—*Phytopath. Zeitschr.*, vi, 2, pp. 177–227, 8 figs., 2 diags., 1933.

A comprehensive account, supplemented by tables, is given of the writer's investigations on the varietal reaction of apples to infection by *Sclerotinia fructigena* in Austria.

Even in varieties showing resistance to brown rot in nature, inoculation after wounding the skin produced infection, thereby indicating the importance of the skin as a protection against the fungus. A decisive influence on infection by *S. fructigena* is exerted by the prevailing temperature, a marked retardation following a fall below the optimum for the growth of the organism namely, 22° to 25° C. Varietal reaction is affected by a number of internal and external factors, the latter including habitat and climatic conditions, so that hard-and-fast standards of resistance and susceptibility are not generally applicable. However, the Jonathan, Grüner Fürsten, and Rote Jungfer varieties proved uniformly resistant, even under conditions favouring the fungus, while Kaiser Alexander and others were consistently susceptible.

At a stage of ripening when apples inoculated in the laboratory

were most extensively invaded by *S. fructigena*, there were still no symptoms in the open, whereas in parallel tests on apricots with *S. laxa* [*S. cinerea*], the results of field observations and laboratory tests were in agreement.

Apples of a given variety showing greater resistance to *S. fructigena* than other representatives of the same variety were found to have a higher hydrogen-ion concentration. During the process of rotting the hydrogen-ion concentration of the fruit was found to rise.

In artificial inoculation experiments the grey or yellow colour of the conidial cushions cannot be used as evidence of the identity of the fungus, since both occur indifferently in infections by *S. fructigena*. A concentric arrangement was observed only on the Kaiser Alexander and Charlamowsky varieties; on all others the conidia were scattered irregularly over the surface. Conidial formation takes place in darkness as well as in the light. *S. fructigena* appears to secrete toxins producing a staling effect on the medium.

Apples in cold storage.—*Fruit World of Australasia*, xxxiv, 6, p. 329, 1933.

In a test carried out in New South Wales, Granny Smith apples were enclosed in sulphite papers and embedded in wood wool, an equal number of cases being similarly wrapped but embedded in peat moss. After six months' cool storage the fruit packed in the peat moss was much less affected by scald and blue mould [*Penicillium expansum* and other species: *R.A.M.*, xi, p. 659] than that packed in the wood wool, but even the former showed nearly 20 per cent. scald. In another test scald was reduced to about 2 per cent. by wrapping the apples in oiled papers.

Brown rot of stone fruits.—*Fruit World of Australasia*, xxxiv, 6, pp. 335–336, 1933.

It is thought that brown rot of apricots and peaches in Victoria (*Sclerotinia cinerea*) [*S. americana*: *R.A.M.*, viii, p. 386; ix, p. 464] may be considerably reduced by removing and burning all dead twigs or those bearing diseased fruits, and spraying after pruning with Bordeaux mixture 12–5–80 plus 1·5 gall. of a winter white oil, this application being repeated about 1st August, before the buds break.

Turner (W. F.). **Progress in phony Peach disease eradication.** —*Journ. Econ. Entom.*, xxvi, 3, pp. 659–667, 1 diag., 2 maps, 1933.

An account is given of the present situation regarding the distribution and eradication of the phony peach disease [*R.A.M.*, xii, p. 575] in the United States. Between 1929 and 1932, 33,876,304 trees in 8,557 orchards were inspected, of which 370,312 trees in 3,173 orchards were destroyed on account of the disease, which now occurs in 13 States. At the third inspection of lightly infected territory in North Georgia (289 orchards containing 629,413 trees) a reduction of 84·10 per cent. in the number of infections was observed, the corresponding figure for the second

inspection of a heavily infected area (Fort Valley Plateau) comprising 127 orchards with 911,550 trees being 66·74 per cent.—results considered to be decidedly encouraging.

THOMAS (H. E.). **The Quince-rust disease caused by Gymnosporangium germinale.**—*Phytopath.*, xxiii, 6, pp. 546–553, 1 fig., 1933.

The following species of *Crataegus*, not included in previous lists, have been found susceptible to infection by quince rust (*Gymnosporangium germinale*) [*R.A.M.*, xii, p. 452] in central New York: *C. arnoldiana*, *C. beata*, *C. brainerdi*, *C. calpodendron* [*C. tomentosa*], *C. filipes*, *C. holmesiana*, and *C. monogyna* [*C. oxyacantha*]. On some species the larger stems may be infected and prominent swellings and cankers produced. Individual red cedar [*Juniperus virginiana*] trees show marked variations in susceptibility to *G. germinale*, while those readily infected by this rust may be resistant to the apple and hawthorn rusts (*G. juniperi-virginiunae* and *G. globosum*, respectively).

The sporidia may be discharged within 2½ hours after moistening the teleutosori with water, and may begin to germinate within 2 hours after immersion in water. Viable aecidiospores are occasionally found in nature as late as April (at Ithaca) but only in deep-seated aecidia from which dissemination would be difficult. The aecidiospores germinate well at 15° to 18° C. without a preliminary rest period.

The symptoms develop five to eight days after inoculation of the leaves of susceptible *Crataegus* plants with germinating teleutospores, whereas on the more resistant apple foliage they were not observed for 10 to 18 days.

KOCH (L. W.). **Investigations on black knot of Plums and Cherries. I. Development and discharge of spores and experiments in control.**—*Scient. Agric.*, xiii, 9, pp. 576–590, 3 figs., 2 graphs, 1933. [French summary on p. 608.]

After a brief reference to the economic importance of the black knot disease (*Dibotryon morbosum*) of plums and cherries in Canada [*R.A.M.*, x, p. 392], where the disease is stated to have been unusually prevalent in 1928 and 1929, the author gives details of his preliminary investigation of the conditions governing the discharge of the spores of the fungus in the field and laboratory. During the period 1929 to 1933 the date of the first discharge of ascospores observed on *Prunus domestica* in the Niagara peninsula varied from 23rd March to 6th April, after which discharges continued to occur periodically until the end of the first week in June, while perithecia collected on *P. pennsylvanica* discharged their spores as early as 20th November in 1931 under laboratory conditions. In the orchard, rainfall appeared to be the predominating factor determining ascospore discharge, but did not seem to have any bearing on the abundance of the discharge, the latter being apparently governed by temperature, with a minimum below 40° F. and a maximum at temperatures ranging between 50° and 80° in the laboratory. The amount of spores discharged also appeared

to be governed by the degree of maturity of the perithecia. At the time when ascospore discharge ceased, conidia of *D. morbosum* were found in abundance on knots on *P. domestica*, and they continued to be produced throughout the summer. Wind was shown to be an important factor in the dissemination of the ascospores and of the conidia, the latter being apparently also disseminated by atmospheric water.

Preliminary control experiments in an orchard of Lombard plum trees gave a good illustration of the importance of control measures, since in a block of trees that were neither pruned nor sprayed the number of knots increased by 1,655 per cent. within three years, while over 95 per cent. control was obtained in a block that was adequately pruned and sprayed. The spraying schedule which gave the best control was a delayed-dormant spray of either 3 per cent. oil emulsion Bordeaux mixture or 1 in 8 lime-sulphur at about the time the buds were opening, followed by a second application of 1 in 40 lime-sulphur when the shucks [? calyces] were falling, and a third of the same strength some weeks later. Knots on large limbs and trunks were successfully removed by surgical methods.

Hus (P.). **Ziekten en beschadigingen van klein fruit (Bessen, Frambozen, Aardbeien).** [Diseases and injuries of small fruit (Currants, Raspberries, Strawberries).]—*Tijdschr. over Plantenziekten*, xxxix, 6, pp. 121–161, 6 pl., 1933.

Notes are given in semi-popular terms on the symptoms, causes, and control of the following diseases of small fruit in Holland: parsley leaf, nettlehead, or reversion of black currants [*R.A.M.*, viii, p. 44; ix, p. 394]; *Verticillium dahliae* on the same host [ibid., iv, p. 495], this fungus being also held responsible for the so-called 'oedema' and for the sudden wilting and rupture of the cortex ('Bangert' disease) of red and white currants [cf. ibid., iii, p. 317], which are further liable to infection by *Gloeosporium* [*Pseudopeziza*] *ribis* and *Stereum purpureum*, besides suffering from leaf scorch [ibid., xii, p. 302]. Gooseberries are attacked by mildew (*Sphaerotheca mors-uvae*) and a species of *Botrytis* causing die-back of the shoots [cf. ibid., iii, p. 525; iv, p. 44].

Raspberries are affected by a group of viruses collectively designated for the present as mosaic [ibid., viii, p. 44], while the pathogenic fungi described on this host include *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: ibid., vi, p. 739], *Fusarium* sp., *Plectodiscella veneta*, *Didymella applanata*, *Hendersonia rubi* [ibid., ix, p. 117], and *V. dahliae* [ibid., xi, p. 61]. Crown gall (*Bacterium tumefaciens*) [ibid., xi, p. 428] has also been observed.

The diseases of strawberries include mosaic, mildew (*S. humuli*) [ibid., x, pp. 248, 254], and leaf spots caused by *Mycosphaerella fragariae* (the conidial and pycnidial stages of which are *Ramularia tulasnei* and *Ascochyta fragariae*, respectively) [ibid., x, p. 584; xi, p. 463], and *Fabraea fragariae* (*Marssonia* [*Marssonina*] *fragariae*) [ibid., iii, p. 663].

[This paper is also published as *Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 70, 41 pp., 6 pl., 1933.]

Stevens (N. E.). **Strawberry diseases.**—*U.S. Dept. of Agric. Farmers' Bull.* 1458, 17 pp., 9 figs., 1 diag., 1933.

This is a revision of the bulletin issued under the same name in 1925 [*R.A.M.*, v, p. 41].

Orange rust of Blackberry and Raspberry.—*New Jersey Agric. Exper. Stat. Circ.* 282, 2 pp., 1933.

A popular note is given on the symptoms, life-history, and control of the orange rust of blackberry and raspberry (*Gymnoconia interstitialis*) [*R.A.M.*, x, pp. 116, 164] in New Jersey.

Beckwith (C. S.). **Cranberry false blossom.**—*New Jersey Agric. Exper. Stat. Circ.* 275, 4 pp., 4 figs., 1933.

A popular description is given of the false blossom disease of cranberries, which is stated to be assuming a very serious form in New Jersey, with directions for flooding and spraying the bogs to eliminate the insect carrier, the blunt-nosed leafhopper (*Euscelis striatulus*) [*R.A.M.*, x, p. 739].

Schwarz (O.). **Die Zweigdürre des Oelbaumes, verursacht durch Hysterographium oleae n. sp., eine bisher unbeachtet gebliebene Pflanzenkrankheit des östlichen Mittelmeergebietes.** [The withering of Olive twigs caused by *Hysterographium oleae* n. sp., a hitherto unnoticed plant disease of the eastern Mediterranean region.]—*Phytopath. Zeitschr.*, vi, 1, pp. 103–110, 1 fig., 1933.

A description is given of an olive disease occurring in the west and south-east of Turkey and associated with a *Hysterographium*.

The first symptom of the disease on the green, leafy, one- to two-year-old twigs is the appearance of ill-defined grey to blackish spots with a brownish border, which may almost girdle the twig. They usually start at a node and extend downwards to a second or third, attaining a length of 3 to 8 cm. and a width of 5 to 25 mm. During the spring the leaves of the affected twigs turn yellow and fall, as also do any fruits that may be present. No case of renewed growth has been observed, and by the beginning of July the twigs are nearly black and quite desiccated. In July or August scattered fissures, 0·6 to 1·8 by 0·3 to 0·7 mm., develop and in these the apothecia, which measure 0·5 to 1·5 by 0·2 to 0·8 mm. when ripe, appear. The apothecia persist on the twigs apparently for a period of years. Owing to the scattered nature of the infection amid the healthy foliage of the crown, the disease has long remained unrecognized.

The lesions on green twigs show a brown discoloration of the cambial cells and a shrivelling of the walls which are often permeated by inter- and intracellular hyphae. Eventually the disorganized cells collapse completely and become embedded in a flat stroma, 1 to 2 by 0·3 to 1 mm., on which the apothecia develop. The fungus resembles *H. fraxini* but the ascospores were somewhat smaller (26 to 32 by 10 to 14 μ, as compared with 36 to 40 by 15 to 20 μ). Neither this fact nor the divergent symptoms of the disease on a new host would justify the establishment of a new

species, but this step is thought to be warranted by the apparent absence of a conidial form in the life-cycle of the olive pathogen, which is accordingly named *H. oleae* O. Schw. [No mention is made of *H. fraxini* var. *oleastri* Desm. recorded on the same host, of which specimens were received at the Imperial Mycological Institute in February, 1933, on olive twigs from Bornova, Turkey.]

Positive results in inoculation experiments were given only where the infective material was applied to severely wounded surfaces. The wild suckers of an *Oleaster* stock, on which an olive was grafted, also contracted infection by this method, although the former is not susceptible in nature.

It is difficult to form an exact estimate of the damage caused by *H. oleae* owing to the irregular character of the infection, but in Bergama district the losses were roughly calculated at 10 to 30 per cent. of the crop in October, 1931, while in August, 1932, the proportion of dead twigs at Bademye was reckoned to reach 50 per cent. The only practicable line of control seems to consist in the thorough cleansing of the plantations during the spring, all dead and dying twigs being cut out and burnt to prevent the survival of the apothecia.

Riccardo (S.). **Secondo contributo allo studio di una malattia che danneggia le Olive in Calabria: Macrophoma dalmatica —Thüm.—Berl. et Vogl.** [A second contribution to the study of a disease injuring Olives in Calabria: *Macrophoma dalmatica* (Thüm.) Berl. et Vogl.]—*Ann. R. Ist. Sup. Agrar. di Portici*, Ser. III, vi, pp. 209–216, 3 pl., 2 figs., 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 3–4, pp. 190–191, 1933.]

The fungus previously reported as associated with a fruit spot of olives in Calabria [*R.A.M.*, x, p. 607] has now been identified as *Macrophoma dalmatica* [ibid., vi, p. 395; vii, p. 491]. A few pycnidial fructifications were found on the branches, though the leaves appeared to be unaffected. The fungus was found on fruits free from any sign of insect attack.

Carneiro (J. G.). **Algumas doenças mais graves do Abacateiro.** [Some of the most serious Avocado diseases.]—*Rev. Soc. Rural Brasil.*, xiii, 154, pp. 282–284, 2 figs., 1933.

The symptoms of the principal avocado [*Persea gratissima*] diseases in Brazil are briefly described in popular terms, with directions for their control. They include anthracnose caused by *Glomerella cingulata* [*R.A.M.*, viii, pp. 291, 727], mildew (*Oidium* sp.) [ibid., iv, p. 722], verrucosis (*Sphaceloma* sp.) [ibid., xi, p. 625], and fruit rots due to *Fusarium*, *Pestalozzia*, *Cladosporium*, and *Hendersonia* spp., *Diplodia natalensis* [ibid., v, p. 506], and *D.* [*Botryodiplodia*] *theobromae*. The treatments recommended are as follows: against anthracnose and verrucosis, spraying with Bordeaux mixture or a solution of Caffaro powder at the strength of 1 kg. to 100 l. water [see above, p. 683], and against mildew dusting with flowers of sulphur. These measures are only partially effective against the rots, the control of which necessitates careful picking.

CATHCART (C. S.) & WILLIS (R. L.). **Analyses of materials sold as insecticides and fungicides during 1932.**—*New Jersey Agric. Exper. Stat. Bull.* 548, 15 pp., 1932. [Received August, 1933.]

The following data were obtained from the analysis of fungicides submitted for examination by a number of commercial firms in 1932 [cf. *R.A.M.*, ix, p. 325]. Acme Bordeaux mixture—dry powdered form (Acme White Lead and Colour Works, Detroit, Michigan). contained 12·98 per cent. metallic copper (12·75 per cent. guaranteed); Bowker's dry powdered Bordeaux mixture, 12·94 (13); Key Brand special Bordeaux mixture powder, 25·66 (22); Green Cross Cloros Dry Bordo 9 per cent., 10·34 (9); Mechling's Bordeaux mixture powder, 13·23 (12·75); Fungi-Bordo (Sherwin-Williams Co., Cleveland, Ohio), 11·80 (12·75).

Mechling's superfine dusting sulphur contained 99·45 per cent. sulphur; Jersey dry-mix (Ansbacher-Siegle Corp., New York), 64·26; two brands of Koppers' flotation sulphur, 38·56 and 38·47 (35), respectively, and three brands of dry-wettable flotation sulphur [ibid., xii, p. 577], 87·83, 84·36, and 86·02 (80), respectively; 80–20 sulphur-lime dust and two brands of sulpho-tone (Lucas Kil-Tone Co.), 76·31 (80), 60·55 (60), and 61 (60), respectively; Mechling's dry-mix and superfine 80–20 dusting mixture, 63·66 (60) and 80·33 (77), respectively; Niagara dry-mix, the same Company's 80–20 sulphur-lime mixture, two brands each of kolofog and koloform, and kolodust [see above, p. 673], 63·21 (61), 76 (77), 37·48 (30), 38·88 (30), 68·05 (54), 65·34 (54), and 91·67 (90), respectively.

Bowker's concentrated lime-sulphur (solution) contained 25·01 per cent. total sulphur; G.L.F. lime-sulphur solution (Co-operative G. L. F. Mills, Inc., Buffalo, N.Y.), 25·78; two Orchard Brand lime-sulphur solutions (General Chem. Co., New York), 25·19 and 25·07, respectively; Mechling's concentrated lime-sulphur solution, 23·35; and Niagara lime-sulphur solution, 24·90.

Acme lime-sulphur, dry powdered form, contained 62·41 per cent. total sulphur; Bowker's dry lime-sulphur, 62·23; Key Brand dry lime-sulphur, 63·17; Mechling's dry lime-sulphur, 62·31; Niagara dry lime-sulphur, 62·70; and Sherwin Williams dry lime-sulphur, 62·28.

The figures for a number of miscellaneous brands are also given.

GRAHAM (J. J. T.). **Report on insecticides and fungicides.**—*Journ. Assoc. Official Agric. Chemists*, Washington, xvi, 2, pp. 151–152, 1933.

Further studies were made of two methods for the analysis of Bordeaux-lead arsenate mixture [*R.A.M.*, xi, p. 663], two samples being selected for collaborative investigation, (1) containing 22·35 per cent. lead oxide and 12·53 per cent. copper, and (2) 17·60 per cent. lead oxide and 14·45 per cent. copper. The results [which are tabulated] of the analyses were very satisfactory. There is little choice between the two methods [one of which appears to be similar to Bubb's: ibid., x, p. 807], but the second, an electrolytic method devised by C. G. Donovan, is somewhat quicker and more uniform. It is recommended that the latter be adopted as official (first action) and further studied.

Lacorte (C. G.). **Estudio sobre el sulfuro de calcio.** [A study on lime-sulphur.]—*Bol. Mens. Min. Agric. Nac.*, Buenos Aires, xxxii, 3, pp. 455–464, 1933.

A general account is given of the constituents, technique of testing, preparation, and manufacture of lime-sulphur in the Argentine, together with the methods of analysis according to the requirements of the Association of Official Agricultural Chemists (U.S.A.) [see preceding abstract].

Goldsworthy (M. C.) & Green (E. L.). **Some promising fungicides.**—*Phytopath.*, xxiii, 6, pp. 561–562, 1933.

Promising results in the control of scab (*Venturia inaequalis*) and bitter rot (*Glomerella cingulata*) of apple, brown rot (*Sclerotinia fructicola*) [*R.A.M.*, xii, p. 228] and scab (*Cladosporium carpophilum*) of peach, and pecan scab (*C. effusum*) [ibid., xi, p. 213], have been obtained in laboratory trials at the Arlington Farm, Virginia, by copper oxide, copper silicate, and copper phosphate, ground sufficiently fine to pass through a 300-mesh screen, or to the standard of Portland cement, and combined with bentonite [ibid., x, p. 533] flocculated by lime. None of the compounds injured the York and Grimes apples used in the field tests, but copper phosphate caused some damage (though less than Bordeaux mixture) to Hiley peaches. Infection was practically absent in the orchard, so that no judgement could be formed respecting the efficacy of the fungicides on a large scale. It was ascertained, however, by placing spores of the test fungi on slides hung among the leaves of the host and sprayed with the tree, that the materials exert their toxicity under orchard conditions for at least ten days (21 in the case of copper phosphate). The following formula was used: copper silicate, oxide, or phosphate 2 lb., hydrated lime or equivalent CaO 4 lb., bentonite 2 lb., a standard insecticide 1 lb., and water 50 galls. The same amounts of copper and lime, mixed with 4 lb. bentonite and 1 lb. insecticide, produce a dust with good physical properties

Jørgensen (C. A.). **Afprøvning af Jorddesinfektionsmidler.** [Tests of soil disinfectants.]—*Tidsskr. for Planteavl*, xxxix, 2, pp. 316–328, 1 fig., 1933.

Details are given of a series of experiments carried out at the State Phytopathological Experiment Station, Lyngby, Denmark, during 1931–2 on a number of soil disinfectants for their efficacy against *Rhizoctonia* [*Corticium*] *solani* on cucumbers, *Pythium de Baryanum* on cauliflower, and *Plasmodiophora brassicae* on swedes.

Pythium de Baryanum was completely controlled by carbololie [oil] I and II (M. Jensen, Svendborg Carton and Cement Factory), at the rate of $\frac{1}{4}$ to $\frac{1}{2}$ kg. per sq. m. in 15 l. water, four weeks before planting; germisan (two applications of a 0·125 per cent. solution with a ten-day interval, at the rate of 6 to 8 l. per sq. m.); kerol (Cooper, McDougall & Robertson, Ltd., England) [*R.A.M.*, xii, p. 420], applied at the rate of 1 l. in 400 l. water per sq. m. three weeks before planting; Koefoed-Johnsen's (Copenhagen) soil sterilizer (1 kg. per sq. m.); pure carbolic acid, 250 gm. per sq. m. in 10 l. water, applied four weeks before planting; formalin (same

rate, three weeks before planting); and heating in a stove for two to three hours at 90° to 95° C. Some degree of control was also given by several other substances.

Excellent control of *C. solani* was obtained by one or two applications of 75 gm. uspulun per sq. m. dissolved in water; mercuric chloride + saltpetre (3 to 5 gm. of the former and 30 gm. of the latter in 6 l. water per sq. m., a week before planting); and heating the soil as against *P. de Baryanum*.

Pure carbolic acid, formalin, uspulun, and sterilization by heat entirely eliminated *Plasmodiophora brassicae*, against which some of the other substances were moderately effective.

Generally speaking, these results indicate no superiority for the patent preparations as compared with pure chemicals or the far more widely applicable method of sterilization by heat.

McCallan (S. E. A.) & Wilcoxon (F.). **The form of the toxicity surface for copper sulphate and for sulphur, in relation to conidia of Sclerotinia americana.**—*Contrib. Boyce Thompson Inst.*, v, 2, pp. 173–180, 3 graphs, 1933.

In a brief introduction the authors show that the data obtained from the various types of curves encountered in toxicity studies of various substances [*R.A.M.*, xi, p. 730] may be plotted on the surface of a solid model (constructed for each particular substance) in which the three co-ordinates are time, concentration of the toxic agent, and percentage number of similar organisms exhibiting a certain response to the substance. By way of illustration, two such 'toxicity surfaces' are figured, which were determined for the germination of conidia of *Sclerotinia americana* in the presence of copper sulphate (soluble toxic agent) and of sulphur dust (insoluble agent), respectively.

The evidence obtained during this work indicated that the accuracy of toxicity tests [loc. cit.] depends not only on the number of organisms (spores) used, but also on the form of the toxicity surface, and that a knowledge of the latter makes it possible to determine in what region to work in order to obtain the greatest precision. High precision is unobtainable if the percentage germination is very high or very low, the point of minimum error varying in dep ıdence on the form of the toxicity surface. It was further shown that toxic substances may be compared as conveniently on the basis of the time periods required for an equal percentage response as on the basis of the percentages responding in equal times, since both methods are capable of equal precision at a given point of the toxicity surface.

Ribereau-Gayon (J.). **Sur la solubilité des composés cuivriques des bouillies anti-cryptogamiques.** [On the solubility of the copper compounds of anti-cryptogamic mixtures.]—*Comptes rendus Acad. des Sciences*, cxcvii, 3, pp. 267–268, 1933.

It was ascertained by the electrometrical method that the concentration of copper ions in Burgundy mixture is a thousand times higher than in Bordeaux mixture, a fact that may well account for the scorching of the young foliage by the former preparation. In the writer's experiments the behaviour of the so-called 'inverted

Bordeaux mixture' (obtained by pouring copper sulphate into lime) was exactly the same as in the ordinary reverse procedure, so that any difference in the efficacy of the two preparations cannot be attributed to variations in the solubility of the components.

MAUME (L.) & BOUAT (A.). **Zones de stabilité en fonction du P_H des divers composés cupriques d'une bouillie bourguignonne.** [Zones of P_H stability of the various copper components of a Burgundy mixture.]—*Comptes rendus Acad. des Sciences*, cxcvi, 26, pp. 2024–2026, 1933.

A fully detailed and tabulated account is given of the writers' experiments, conducted by the micro-electrolytic and volumetric methods, to determine the relation of the reaction of the medium to the precipitation of the various copper components of Burgundy mixture [cf. *R.A.M.*, iv, p. 298; vii, p. 552; x, p. 156]. The chemical composition of the mixture was found to depend very closely on the P_H of the medium, each insoluble copper component being able to exist only between certain narrow limits of acidity.

GINSBURG (J. M.). **Compatibility of oil emulsion-cresylic acid sprays with fungicides.**—*Journ. Econ. Entom.*, xxvi, 3, pp. 566–571, 1933.

Laboratory tests with oil emulsion-cresylic acid spray mixtures were conducted with a view to improving their stability on amalgamation with fungicides such as Bordeaux mixture and lime-sulphur. Subsequently field trials were carried out on five blocks of apple trees of the Grimes, Stayman, Wealthy, and Paragon varieties at the New Jersey Agricultural Experiment Station with five selected spray mixtures, in order to ascertain whether the addition of fungicides to an oil-cresylic spray impairs its toxicity to aphis or red mite [*Paratetranychus pilosus*]. Freshly made 4–6–50 Bordeaux produced a stable mixture with 3 per cent. oil emulsions containing 0·5 per cent. cresylic acid. Lime-sulphur (1 in 9 or 1 in 40) alone was not compatible with oil emulsions containing cresylic acid, but with the addition of 3 lb. skim milk and the use of 0·5 per cent. of a colloidal cresylic acid (prepared by adding 20 per cent. soap to the ordinary 95 per cent. cresylic acid) per 100 galls. a mixture of stable consistency was obtained. Neither Bordeaux mixture nor lime-sulphur caused any decrease in the toxicity of the oil-cresylic sprays to the insect eggs, and the use of combined preparations of this type is recommended as a practical and economical means for the joint control of apple pests and diseases.

HEIM (R.) & LAMI (R.). **La maladie bactérienne des Zostères: extension et causes favorisantes.** [The bacterial disease of the *Zosterae*: distribution and predisposing factors.]—*Comptes rendus Acad. d'Agric. de France*, xix, 20, pp. 738–742, 1933.

So disquieting were the reports from various coastal districts in France on the extent and severity of the bacterial disease of the grass-wrack seaweed (*Zostera marina*), first observed during the winter of 1931–2 [*R.A.M.*, xii, p. 308], that the responsible government departments recently undertook a scientific investigation of the problem. The results of this inquiry have shown that the

grass-wrack is destroyed along the greater part of the Cotentin and Brittany coasts, round Saint-Nazaire, in the Arcachon basin and in a lesser degree also in the Vendée and Charente. Information from the Mediterranean regions is less reliable owing to the common confusion of *Z. marina*, not only with the seemingly immune *Z. nana*, but also with the other Potamogetonaceae, *Cymodocea nodosa* [*C. aequorea*] and *Posidonia caulini*. However, the bacterial disease appears to have caused damage in a number of fishponds and along the coast between Martigues and the Italian frontier, while it is also reported from the coasts of Holland, Portugal, the south of England, [Canada, and the United States: ibid., xii, p. 646].

Among the factors probably predisposing the grass-wrack to bacterial invasion may be mentioned the very severe frosts of the winter of 1931–2; mechanical injury by drag-nets, dredging machines, and the like, as well as by epiphytic algae; and water pollution by factory residues or the copper sulphate from vineyards. None of these causes, however, can be more than contributory to the primary action of the bacteria. Spontaneous recovery from the disease appears to have occurred in some places.

Not only are the local uses of the grass-wrack seaweed (manure, packing, stuffing, and so forth) affected by the new disease, but a number of fish and molluscs are disappearing from the regions under observation.

HENRY (L. K.). **Mycorhizas of trees and shrubs.**—*Bot. Gaz.*, xciv, 4, pp. 791–800, 6 figs., 1933.

Mycorrhiza of three types, ectotrophic, endotrophic, and ectendotrophic, have been detected on 60 different trees and shrubs in Butler County, Pennsylvania, 26 of which are stated to be new additions to the list of mycorrhizal host plants. Lists are given of the species involved, showing the type of mycorrhiza in each case, while the salient features of the symbionts are presented in tabular form.

KNUDSON (L.). **Non-symbiotic development of seedlings of Calluna vulgaris.**—*New Phytologist*, xxxii, 2, pp. 115–127, 2 pl., 1933.

Further experiments are reported in detail substantiating the writer's former contention that sterile seedlings of *Calluna vulgaris* develop roots on various culture media with or without sugar and without the intervention of any fungus [*R.A.M.*, ix, p. 398]. Some of the seeds germinated in a few days and it was possible to maintain them in tube culture for several months. Well-developed seedlings were placed in tubes containing potato-dextrose agar and incubated for eight months, at the end of which no fungi were found in or on the plants or in the medium. Microscopic examination of the roots failed to show the presence of any fungi or other organisms. Both potato- and peptone-dextrose agar were found to be toxic to *Calluna* roots, the latter being probably responsible for the stubby condition observed by Dr. Rayner in her asymbiotically germinated seedlings. The author has been unable to find

any evidence of the necessity of *Phoma radicis calunae* to proper root development in *C. vulgaris*.

MIRIMANOFF. **Sur la castration parasitaire chez Anemone ranunculoides L.** [On parasitic castration in *Anemone ranunculoides* L.]—*Bull. Soc. Bot. de Genève*, Sér. 2, xxiv (*1931–2*), pp. 264–265, 1933.

A plant of *Anemone ranunculoides* attacked by *Puccinia prunispinosae* [*R.A.M.*, xii, p. 451] at Onex, Switzerland, showed hypertrophy of the stem, extensive involvement of the lower surface of the involucrum, the presence of aecidia and spermogonia in the petals, and a reduction in the size of the latter on the terminal flower, as well as of the carpels, the stamens and pollen grains remaining normal. The floral modifications caused by the fungus in this case did not result in parasitic castration of the type described by A. Magnin on the same host infected by *Aecidium leucospermum* and *A. punctatum* (*Bull. sci. Fr. Bely.*, xxiii, p. 412, 1891).

RIPPEL (K.). **Saugkraftmessungen an Sporen von Cladosporium fulvum Cooke und anderen Pilzen und Grundsätzliches zur Methodik der Saugkraftmessungen.** [Osmotic measurements on the spores of *Cladosporium fulvum* Cooke and other fungi, with observations on the principles underlying the method of osmotic measurements.]—*Arch. für Mikrobiol.*, iv, 2, pp. 220–228, 1 graph, 1933.

The author traces a direct correlation between the osmotic capacity of the spores of certain fungi and their speed of germination. In a 1·3 mol. cane sugar solution (65·8 atmospheres), the spores of *Cladosporium fulvum* required 72 hours for 100 per cent. germination, the corresponding periods for *C. herbarum*, *Botrytis cinerea*, and a species of *Botrytis* found parasitizing *C. fulvum* [*R.A.M.*, xii, p. 194] being 48, 24, and 10 hours, respectively. *C. fulvum*, therefore, possesses the lowest osmotic capacity of the four organisms under observation. This fact was confirmed by a further germination test in a 1·96 mol. cane sugar solution (112 atm.), in which only a trace of growth by *C. fulvum* was detected after 10 days; after 5 days 70 per cent. of the *C. herbarum* spores had germinated, and after 3 days 100 per cent. of *B. cinerea* and *B.* sp. (90 per cent. of the last-named on the first day). The immensely high osmotic capacity of the *Botrytis* found on *C. fulvum* in comparison with the latter provides the nutrient-physiological basis for the parasitism of the one by the other. The apparent susceptibility of *C. fulvum* to sodium chloride in previous tests would appear from the present results to be due to its poor osmotic capacity rather than to the action of the relatively weak fungicide in question.

CHALLENGER (F.). **The formation of volatile arsenic compounds by moulds.**—*Indus. Chem.*, ix, 99, p. 134, 1933.

According to Gosio arsenical gas is produced from media con-

taining arsenic [*R.A.M.*, xii, p. 384] by *Aspergillus glaucus*, *A. virens*, *Mucor mucedo*, *M. ramosus*, and *Penicillium brevicaule*.

The writer inoculated breadcrumbs with strains of *P. brevicaule* and added to the cultures aqueous solutions of various sterilized arsenic compounds. Using arsenious oxide precipitates were obtained on absorption in acid mercuric chloride solution of the di- and monomercurichlorides of trimethylarsine, $(CH_3)_3As.2HgCl_2$ and $(CH_3)_3As.HgCl_2$. Arsenical or Gosio gas, then, is trimethylarsine, a volatile liquid of boiling-point 53° C., the identity of the substance being further confirmed by the formation of trimethylarsine-hydroxynitrate and -hydroxypicrate and trimethylbenzylarsonium picrate. When arsenious oxide is replaced by sodium methylarsonate or sodium cacodylate, a strong garlic odour is evolved. When sodium ethylarsonate was added to cultures of the mould on sterile breadcrumbs the resultant gas was identical with synthetic dimethylethylarsine. These results clearly show that the moulds are capable of methylating arsenic in certain types of organic or inorganic combination, and also of effecting reduction of quinquevalent to tervalent arsenic.

A similar methylation is observed when *P. brevicaule* is grown on breadcrumbs containing sodium selenate, the gas evolved being identical with dimethyl selenide, $(CH_3)_2Se$. With potassium telluride a malodorous gas is eliminated, probably dimethyl telluride, $(CH_3)_2Te$.

Ahmet (H.). **Untersuchungen über Tracheomykosen.** [Investigations on tracheomycoses.]—*Phytopath. Zeitschr.*, vi, 1, pp. 49–101, 9 figs., 1 graph, 1933.

The salient points in the phase of these studies dealing with toxin formation by *Fusarium vasinfectum* and *F. lycopersici*, the agents of cotton and tomato wilt, respectively, have already been noticed from another source [*R.A.M.*, xii, p. 387]. This forms the major part of the investigations reported.

Both fungi were found to be capable of attacking their respective hosts without the aid of other organisms or of mechanical wounding. Two types of infection may be differentiated among young plants, namely, chronic (especially in tomato) and acute, varying (under experimental conditions) according to the method of inoculation. Soil infections caused the acute type in cotton seedlings, whereas wound infections by inoculation on the plant itself were difficult to secure. Older plants generally develop the disease in an acute form. Marked differences in the length of the incubation period were induced by alterations in the mineral food supply, the wilt symptoms developing soonest (17 days) in the plants deprived of potash and latest (58 days) in those receiving little nitrogen.

Transpiration was found to be reduced in both chronically and acutely diseased tomato plants.

On the one hand, the fusarioses of tomato and cotton are associated with mechanical obstruction of the vessels by the hyphae, a condition remediable by the removal of the infected portions, while on the other, an important part is played by the toxins produced by the fungi within the plants.

RIVERA (V.). **Condizioni fisiologiche di predisposizione di tessuti vegetali ad attachi crittogamici.** [The physiological conditions predisposing plant tissues to fungal attacks.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxix, 4, pp. 689–690, 1932.

After pointing out that it is known that in attacks by the Erysiphaceae the host tissues show resistance as long as the green cells are in a state of maximum turgidity and that, conversely, reduction in resistance always follows a decrease in such turgescence [*R.A.M.*, iv, p. 108], the author states that the same observation also applies to epidemic attacks by other groups of fungi; hence, the fact that infection becomes possible only when there is reduced turgescence with a consequent suspension or weakening of anabolic activity is of the first importance in the study of the conditions in which plants become susceptible to fungal attack in general.

JØRGENSEN (C. A.) & NIELSEN (O.). **Kartoffelsorter og Kartoffelsygdomme. Orienterende undersøgelser.** [Potato varieties and Potato diseases. Preliminary investigations.]—*Tidsskr. for Planteavl*, xxxix, 2, pp. 295–315, 1933.

A detailed and tabulated account is given of the writers' investigations, carried on at Lyngby, Denmark, from 1926 to 1930, on the reaction of some standard potato varieties to late blight (*Phytophthora infestans*), leaf roll, mosaic, *Rhizoctonia* [*Corticium*] *solani*, blackleg (*Erwinia phytophthora*) [*Bacillus phytophthorus*], and scab (*Actinomyces* spp.).

In discussing the reaction of the different varieties to *P. infestans*, the tops and tubers are separately considered. Highly resistant tops are a feature of Betula and Silesia, the former showing the same character as regards the tubers, while the latter is only moderately resistant to tuber infection. Highly susceptible in respect of top infection are Sigyn and Æggeblomme [Egg Plum], the former being moderately susceptible also to tuber attack and the latter extremely so. A marked degree of resistance to tuber infection characterizes Parnassia, Majestic, Rubin, Pepo, Burbank, King George, Rheinland, Magnum Bonum, Acme, and Deodara [cf. *R.A.M.*, xi, p. 71], while a number of other varieties are intermediate in their reaction both to top and tuber invasion.

Some varieties with very susceptible tops have resistant tubers and vice versa. The increased yield obtained by spraying with Bordeaux mixture ranged from 3 to 27 per cent., the former for Pepo (susceptible tops but very resistant tubers) and the latter for Richter's Imperator (susceptible tops but fairly resistant tubers).

Both mosaic and leaf roll are stated to be prevalent at the Lyngby Phytopathological Experiment Station and in the vicinity [ibid., viii, p. 152; ix, p. 741; xi, p. 467], and for four years comparative observations have been conducted on local material and on plants of the same varieties grown at Tylstrup, Vendsyssel [extreme north of Jutland], where both diseases occur only to a very limited extent. In the fourth year the northern-grown tubers were brought down for testing at Lyngby. The Pepo and King George varieties proved highly resistant to both disturbances when grown throughout at Lyngby; Acme, Rheinland, Rubin,

Bravo, and Sigyn gave satisfactory results as regards leaf roll but were very susceptible to mosaic. Magnum Bonum and Egg Plum contracted leaf roll in an exceptionally severe form. Of the northern material, Askebladet, Juli, and Early Rose proved highly susceptible to leaf roll (Juli also to mosaic), and the yields of these varieties were much reduced by cultivation in the unfavourable environment of Lyngby. Sharpe's Victor and Webb's Early gave more promise of resistance.

Tuber infection by *C. solani* ranged from 8 to 46·8 per cent., being most severe on Kerr's Pink, Rubin, Up-to-Date, Acme, Silesia, and Majestic, while Rheinland, Deodara, and Magnum Bonum remained relatively clean.

Blackleg did not assume a very serious form during the period of the tests. The most susceptible varieties appear to be Betula, Deodara, and Kerr's Pink. Scab was also relatively unimportant, the early varieties being little affected (except Goldperle), while among the later ones Up-to-Date, King Edward, Magnum Bonum, and Kerr's Pink are liable to heavy attacks.

GARBOWSKI (L.). **Choroby virusove Ziemniaków w okresie 1928–1932 r.** [Virus diseases of Potatoes during the period from 1928 to 1932.]—*Prace Wydz. Chorób Roślin Państw. Inst. Naukow. Gospod. Wiejsk. w Bydgoszczy* [*Trans. Phytopath. Sect. State Inst. Agric. Sci. in Bydgoszcz*], 13, pp. 3–136, 24 pl., 1933. [French summary.]

In the first part of this paper the author gives a very comprehensive review of the latest developments in the study of the so-called 'degeneration' diseases of the potato, both along the lines followed by the German school in Berlin-Dahlem, which tends to explain them by the influence of physiological and ecological factors on the development of the plant, and along those of the English, American, and Dutch workers who claim that they are due to the existence of different virus entities, and to whose views he personally adheres. Most of the work reviewed has been noticed from time to time in this *Review*.

In the second part notes are given on the behaviour in the field in Poland during the period from 1928 to 1932, in regard to virus diseases, of 46 Polish, 49 German, 11 English, and 4 Dutch varieties of potato, the great majority of which exhibited symptoms of mixed infection. Typical leaf roll was seen in the varieties Alma, Anna, and Wohltmann, while acute crinkle, with some admixture of mosaic, was shown by Topaz, Ursus, and Minister Miquel. Under the conditions prevalent at Bydgoszcz the greatest resistance to infection with the virus diseases was exhibited by the varieties Svitez, Tytan, Hermes, Wloszanowskie 12 and 112, Wekaragis, and Parnassia. The effect of the virus diseases on the yield and size of tubers is shown in each case in comparative tables. Aucuba mosaic was found on the variety Juli, and streak on a number of varieties, this being the first record of both diseases for Poland.

Tables are given showing the diminution in yield caused by various virus diseases in a number of varieties including Early Rose and Arran Chief, and there are brief notes on the reaction

to virus infection of several other British varieties under local conditions.

A bibliography of 92 titles is appended.

LOUGHNANE (J. B.). **Insect transmission of virus A of Potatoes.** —*Nature*, cxxxi, 3319, pp. 838–839, 1933.

Attempts at the Albert Agricultural College, Glasnevin, Dublin, to transmit potato crinkle [*R.A.M.*, xii, p. 588] from the President and Irish Chieftain varieties by means of the aphid *Myzus persicae* resulted, in healthy specimens of President, merely in a mild form of veinal mosaic. The latter was not simple mosaic, for it produced acronecrosis by grafting on British Queen and Up-to-Date, and veinbanding by needling to tobacco, while it caused no symptoms on *Datura stramonium*. These manifestations are typical of Murphy's virus A [ibid., xi, p. 740]. When simple mosaic was grafted on President containing this aphid-transmitted disease, typical and persistent crinkle symptoms developed in the stock plants.

Virus A was also transmitted direct from Irish Chieftain potatoes [on which it produces very faint or no symptoms: loc. cit.] by means of *M. persicae* to healthy President, British Queen, Up-to-Date, President containing a simple mosaic derived by needle inoculation from crinkle, and tobacco, with the same results as described above.

It is evident, therefore, that *M. persicae* is an efficient vector of virus A from potato to potato and tobacco, and that it transmits it selectively to the exclusion of the simple mosaic element from crinkled plants. The aphid-borne virus *y* is not identical with A, being readily returned by needle from tobacco to potato, in which it produced crinkle and leaf-drop streak in the President variety. Virus A is not thus returnable, nor has it been known to produce such symptoms in this variety. As already suggested by Murphy [ibid., xi, p. 738], virus A may also have been present in Smith's crinkle from Myatt's Ashleaf, in which case it would be carried by the insect along with *y*, and since both produce similar veinbanding symptoms in tobacco, no evidence of its presence in that plant would be apparent, while the effect of this particular *y* on President was so severe as to obscure the faint traces of A.

Virus A may also be transmissible by *M. circumflexus*, but attempts to cause infection by means of *M. solani*, *Lygus pabulinus*, and *Calocoris bipunctatus* gave negative results.

SMITH (O.). **Effect of soil reaction on the growth of the Potato.** —*Amer. Potato Journ.*, x, 6, pp. 118–121, 1933.

It is commonly supposed by potato-growers that the incidence of scab [*Actinomyces scabies*: *R.A.M.*, xii, p. 651] increases in proportion to the alkalinity of the soil, and up to a certain point most experiments confirm this belief. However, a series of field trials in western New York indicated that, with an increase in the P_H of the soil beyond 6·51, the amount of infection decreases. Thus, tubers grown in soil with a reaction of P_H 7·16 to 7·45 were less scabby than those in any other plot above P_H 5, the maximum

amount of infection occurring in plots with a hydrogen-ion concentration ranging from P_H 6·08 to 6·51. In tests with the Green Mountain variety on Long Island, P. H. Wessels (*Cornell Agric. Exper. Stat. Bull.* 536, 1932) found that the amount of scab continued to increase up to P_H 6·9 or 7.

SZYMAŃSKI (W.). **Studja biochemiczne nad porażeniem Zemniaków grzybkiem raka ziemniaczanego.** [Biochemical studies on Potato wart disease.]—*Prace Wydz. Chorób Roślin Państw. Inst. Naukow. Gospod. Wiejsk. w Bydgoszczy* [*Trans. Phytopath. Sect. State Inst. Agric. Sci. in Bydgoszcz*], 13, pp. 141–162, 1933. [French summary.]

This is a summarized report of the author's investigation of the biochemistry of healthy potato tubers (Deodara variety), as compared with that of tubers infected with wart disease (*Synchytrium endobioticum*) and that of the wart outgrowths themselves. The results [which are presented in the form of tables] showed that the specific gravity of wart-infected tubers was greater than that of healthy ones (averages 1·119 and 1·108, respectively), and that of the warted tissue itself smaller (1·074). The dry weight of the infected tuber tissue averaged 28·47 per cent. of the fresh material in 1929 and 25·9 per cent. in 1932, of healthy tissue 24·95 and 22·7 per cent., respectively, and of the warted tissue 22·3 and 19·8 per cent., respectively, while the average ash contents amounted to 4·45, 4·82, and 7·88 per cent., respectively. Quantitative analysis of the ash obtained from healthy and warted tissue showed a greater accumulation in the latter of most of the mineral constituents, especially of iron (0·024 and 0·123 per cent. Fe_2O_3, respectively), manganese (0·00180 and 0·00388 per cent. MnO, respectively), copper (0·00216 and 0·00460 per cent. CuO, respectively), and nitrogen (0·0884 and 0·1056 per cent. aminoacid and polypeptide nitrogen). It is suggested that it is these elements that stimulate the proliferation of the warted tissue in infected tubers.

MEYER-HERMANN (K.). **Der Einfluss von Konservierungsmitteln auf die Haltbarkeit der Kartoffeln.** [The effect of preservatives on the keeping quality of Potatoes.]—*Deutsche Landw. Presse*, lx, 22, p. 282, 1933.

Excellent control of the tuber rotting due to *Phytophthora infestans* among potatoes stored in a cellar is reported from the Harleshausen (Germany) Plant Protection Station as a result of sprinkling 'karsan' (Chem. Fabrik L. Meyer, Mainz) on the floor and between the layers of tubers. Even when rotting had already developed actively its spread to the sound tubers was immediately arrested by treatment with the dust so that by the spring only individual cases of rotting were found, while the tubers left untreated as controls were completely rotted away. There is also some indication (requiring further confirmation) that precocity of germination in store and consequent premature depletion of the tubers may be avoided by the use of karsan.

Schlumberger [O.]. **Fusskrankheiten der Kartoffel.** [Foot rots of the Potato.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlviii, 22, pp. 487–488, 1933.

Popular notes are given on the conditions predisposing potatoes to infection by *Rhizoctonia* [*Corticium solani*] and blackleg [*Bacillus phytophthorus*] in Germany, with instructions for their avoidance by appropriate cultural measures.

Chamberlain (E. E.) & Brien (R. M.). **Verticillium-wilt of Potatoes and Tomatoes in New Zealand.**—*New Zealand Journ. of Sci. & Techn.*, xiv, 6, pp. 366–377, 4 figs., 1933.

This is a more technical account of the wilt disease of Aucklander Tall-top and Aucklander Short-top potatoes and glasshouse tomatoes caused by *Verticillium albo-atrum* in New Zealand than that already noticed [*R.A.M.*, xii, p. 403]. Cross-inoculations with isolations of the fungus gave positive results on both hosts. The symptoms of the disease and the morphology of the parasite are described, and the taxonomy of the latter is discussed. Specimens of tomatoes received from Nelson, South Island, after the preparation of this paper for publication, appear to be infected by a distinct strain of *V. albo-atrum*.

Nisikado (Y.) & Matsumoto (H.). **Studies on the physiological specialization of Gibberella fujikuroi, the causal fungus of the Rice 'bakanae' disease.**—*Trans. Tottori Soc. Agric. Sci.*, iv, 3, pp. 200–211, 1933. [Japanese, with English summary.]

Inoculation experiments were carried out with 66 strains, collected from various parts of Japan, of *Gibberella fujikuroi*, the agent of the 'bakanae' disease of rice, and with five strains of *G. moniliformis* and its var. *majus*, maize being used as a host in preference to rice owing to the particular clearness of the symptoms on the former [*R.A.M.*, xii, p. 590]. Marked differences in pathogenicity, as indicated by the degree of overgrowth on the inoculated plants, were shown by the various strains.

Thomas (K. M.). **The 'foot-rot' of Paddy and its control.**—*Madras Agric. Journ.*, xxi, 6, pp. 263–272, 1 pl., 1933.

The rice disease (for which the descriptive name foot rot is suggested), first described by the author from the Godavari Delta in 1931 [*R.A.M.*, x, p. 336], has since been found to occur in other parts of the Madras Presidency, and to affect either sporadically or as a result of inoculation over fifty varieties from all the important rice tracts of the province. In addition to the symptoms previously described, an abnormally profuse branching of the main roots, giving the root system a woolly appearance, was seen on well-established plants affected with the trouble, a feature which, together with the production of adventitious roots from the upper nodes of infected fully grown plants, and the complete failure of transplanted infected seedlings to recover, seems to distinguish this disease from the Japanese 'bakanae' disease [see preceding abstract], with which it has many features in common. The causal organism was isolated and found to be an as yet unidentified

species of *Fusarium*, the perfect stage of which has not been obtained so far in nature or in pure culture.

Field experiments from the end of 1930 to 1932 indicated that good control of the disease is obtainable by seed-grain treatments, among which formalin (1 per cent. for 15 minutes), hot water (55° C. for 30 minutes), copper sulphate (2 per cent. solution for 30 minutes), ceresan dust (1 gm. per 1 lb. seed), uspulun (0·5 per cent. solution for 30 minutes), and granosan dust (1 gm. per 1 lb. [ibid., xii, p. 140] were the most effective. Field tests in 1931 of 41 distinct varieties of rice, in which the seed was steeped in a spore suspension of the fungus, showed that none of the varieties was absolutely immune, but that relative resistance ranged from almost complete resistance (in Wateribune, Aryan, and G.E.B. 24) to great susceptibility.

MURRAY (R. K. S.). **Mycologist's report for 1932.**—*Eleventh Ann. Rept. Rubber Res. Scheme (Ceylon), 1932*, pp. 18–21, 1933.

This is a brief report of the work done during 1932 in the investigation of diseases of *Hevea* rubber in Ceylon, most of the information contained having already been noticed from other sources [cf. *R.A.M.*, xii, p. 591]. A brief note is included on bark renewal experiments, a report on which is in course of publication.

DE JONG (W. H.). **Het parasitisme van Rigidoporus microporus (Swartz) Van Overeem, Syn: Fomes lignosus Klotzsch, bij Hevea brasiliensis.** [The parasitism of *Rigidoporus microporus* (Swartz) Van Overeem, Syn: *Fomes lignosus* Klotzsch, on *Hevea brasiliensis*.]—*Arch. voor Rubbercult. Nederl.-Indië*, xvii, 4–6, pp. 83–104, 1933. [English summary.]

An inspection of several thousand *Hevea* rubber trees near Kisaran (east coast of Sumatra) showed that *Fomes lignosus* [*R.A.M.*, xii, p. 54] was present on the decayed roots of trees of all ages up to 22 years. The rot caused may be either dry or moist, the latter apparently due to secondary bacterial infection. A large number of the trees inoculated with pure mycelial cultures of *F. lignosus* developed a profuse growth of mycelium on the root-collars and roots, but in no case did decay ensue and the rhizomorphs finally disintegrated. Infection did not seem to be promoted by the presence of wounds on the inoculated roots. Out of twelve nine-month-old trees of poor growth but otherwise healthy, inoculated with pure cultures of the fungus on fair-sized pieces of sterilized wood, one eventually died as a result of the disease. Abundant mycelial development usually followed inoculation with the fructifications of *F. lignosus*, but in no case did rotting result, even on wounded roots. When the inoculum consisted of roots externally covered by mycelium but not decayed, there was an occasional development of superficial infection but no rotting. When decayed wood from the plantations was placed on unwounded, healthy roots, several trees contracted infection and died. It was observed, in connexion with these experiments, that the decay caused by *F. lignosus* often stops of its own accord, the infected areas becoming surrounded by callus and finally healing completely. This process usually coincides with the disintegration

of the inoculating material. In other cases, however, the rotting continues to develop after the exhaustion of the inoculum, probably because the trees have been seriously weakened by the decay caused by the original attack. A detailed account is given in tabular form of two series of inoculation tests, one comprising eleven 14-year-old trees on red soil, and the other ten 18-year-old trees on white and sandy-white soil. In the latter area three trees were killed by the disease within two years from inoculation.

The outcome of these experiments appears to indicate that *F. lignosus* is only a weak parasite on rubber except under special environmental conditions which stimulate the growth of the fungus and impair that of the trees. Among the factors affecting the decay of rubber roots by *F. lignosus* are the presence of decaying wood in close contact with the roots; the size, quantity, and nature of the inoculum; the dimensions of the tree; natural variations in resistance probably due to predisposing environmental conditions; nature of the soil, red soils and quartz sand being particularly favourable to the development of the fungus; the situation with regard to ground cover [loc. cit.]; the previous vegetation of the area, epidemics having been reported on red soils formerly planted with *Ficus elastica*, on red soils and quartz sand previously carrying coco-nuts, and on sites where rubber was preceded by *Koompassia malaccensis* and *Artocarpus elastica*; and manuring treatment, an increase of infection following the combined application of nitrogen, phosphate, potash, and manganese sulphate.

An estimate of the root disease situation in a given area should not be based solely on the presence of mycelial contaminations, which are not necessarily followed by decay. Even where such decay is present, it may cease to extend without treatment, so that a single inspection is of little value but requires to be supplemented by repeated examinations to ascertain the progress of the rot, or still better by an accurate record of the mortality due to the disease.

MA (ROBERTA M.). **Seasonal variations of fungi in soils in the vicinity of Peiping.**—*Peking Nat. Hist. Bull.*, vii, 4, pp. 293–297, 1 graph, 1933.

The results [which are tabulated and discussed] of the writer's study of the seasonal variations among the soil micro-organisms of Peking [*R.A.M.*, xii, p. 656] showed that July is the most favourable month for the growth of the soil fungi and December the least so [cf. ibid., xii, p. 534]. There is a gradual increase in the number of fungi from January to May and a sudden augmentation from June to July, followed by a rapid decrease from July to August and a further slow diminution from September to December. In fertile soils the number of fungi and variety of species are greater than in infertile, a fact that is evidently correlated with the presence in the former of organic matter.

ZATTLER (F.) & WEIGAND (K.). **Über Konzentration der Kupferkalkbrühe, Zeitpunkt und Häufigkeit der Bespritzungen bei der Bekämpfung der Peronosporakrankheit des Hopfens.**—[On the concentration of the Bordeaux mixture and the time

and frequency of treatments in the control of the *Peronospora* disease of Hops.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 3–4, pp. 57–68, 1 graph, 1933.

The best results in a series of experiments [the details of which are fully described and tabulated] on the control of hop downy mildew (*Peronospora*) [*Pseudoperonospora humuli*] in a 15-year-old Hallertau plantation in Bavaria were obtained in 1932 by six applications between 8th July and 6th August of 1 per cent. Bordeaux mixture, followed by a final treatment (18th August) at half strength [*R.A.M.*, xii, p. 243]. The yield of the plots receiving this schedule averaged 368·30 kg. dry hops per 1,000 plants, compared with 112·50 for those left unsprayed. The next best treatment consisted in four applications at 1, two at 2, and 1 at 0·5 per cent., resulting in a yield of 342·50 kg. per 1,000 plants. From the economic standpoint the former schedule is adjudged to be entirely satisfactory.

Martin (J. P.). **Pathology.**—*Ann. Rept. Ctte. in charge of the Exper. Stat. for the year ending September 30 h, 1932* (ex *Proc. Hawaiian Sugar Planters' Assoc., Fifty-second Ann. Meeting, 1932*), pp. 23–42, 1933.

The following are some of the many items of interest in this report. Further investigations into brown stripe of sugar-cane [*Helminthosporium stenospilum*: *R.A.M.*, xi, p. 540] showed that in severely affected localities the soil was deficient in available phosphates, and the cane juice low in P_2O_5; every striped cane contained less P_2O_5 than did healthy canes of the same variety. In certain areas badly affected two years ago heavier applications of phosphoric acid have been followed by a marked decrease in infection, with increased yields per acre both of cane and sugar.

Partly owing to the prevailing weather but mainly as a result of abandoning the practice of applying nitrogenous fertilizers late in the autumn the losses sustained from eye spot [*H. ocellum*: ibid., xi, p. 4] were very much less than those experienced annually from 1924 to 1929.

The marked reduction of mosaic [ibid., xi, p. 539] in areas where it was formerly rife is due to systematic roguing, the use of selected cuttings taken from resistant varieties, and the control of weeds. In experiments by C. W. Carpenter mosaic was mechanically transmitted by Sein's leaf-slip method [ibid., ix, p. 678] to several varieties, an electrically operated needle being used to make the inoculations, in which speed of transfer is important, the mosaic virus deteriorating very rapidly on exposure [cf. ibid., xii, p. 660].

Symptoms identical with those of chlorotic streak of sugar-cane [ibid., xi, p. 674] were found on *Coix lacryma-jobi*. A modified form of hot-water treatment, which consisted in placing the cane cuttings in a volume of water at 53° C. such that after 20 minutes the temperature was reduced to about 50°, gave control of the disease and was less injurious to germination than maintaining a constant temperature. Attempts to transmit chlorotic streak from cane to cane and from *C. lacryma-jobi* to canes by the leaf-

slip method, as well as from diseased canes to healthy cane cuttings with cane knives were unsuccessful. While the author was attending the fourth Congress of Sugar Cane Technologists in Porto Rico in 1932 the disease was recorded there for the first time, and it was then agreed by the pathologists present that the diseases known in Hawaii as chlorotic streak, in Java as the 'fourth disease' [ibid., xii, p. 593], and in Australia as 'pseudo leaf scald' are identical.

So-called 'growth failure' [ibid., vii, p. 271] was in many areas rectified by adjusting soil deficiencies. Non-parasitic root-rot, though previously severe, caused scarcely any losses among seedlings in 1931–2, and it now appears that the disease can be completely controlled by sanitation and constant vigilance in the propagating house. The parasitic form, due to *Pythium* [*aphanidermatum* or a related species: ibid., xi, p. 540], is receiving less attention than formerly, as it is now regarded as a minor factor in the commercial cultivation of the standard varieties.

A preliminary study was made of a soft rot of the nodes of sugar-cane stalks ('nodal stalk rot'), most marked on the underground parts, in which the rotted tissue is watery and soft at first and later turns dark brown. The lower leaf sheaths may be occasionally penetrated and the node beneath affected, the leaf blades turning yellow or dying prematurely. The diseased area extended only a slight distance inside the stalk, but frequently the stalks were completely girdled at the node and the root primordia killed.

An internal stalk necrosis was also observed as a browning of the tissue usually at or slightly below the level of the node. Small, watery areas appeared, which later turned brown or, occasionally, black. The parenchymatous tissue in the internode disintegrated, leaving small cavities surrounded by brownish tissues. The affected areas varied from minute spots to circles 0·5 in. in diameter, while occasionally the entire stalk was affected. The trouble appeared to be of physiological origin.

On p. 63 of this report it is stated that susceptibility to eye spot [*H. ocellum*] is recessive. Highly susceptible canes selfed or crossed together produce only susceptible seedlings, while resistant canes selfed or crossed together give a majority of resistant and a minority of susceptible seedlings.

Ciferri (R.). **La distribuzione e la nomenclatura dei carboni della Canna da Zucchero e delle specie affini.** [The distribution and nomenclature of the smuts of Sugar-Cane and allied species.]—Reprinted from *Boll. Studi ed Informaz. R. Giard. Colon. di Palermo*, xiii, 7 pp., 1933. [English summary.]

After briefly discussing the smuts (*Ustilago* spp.) reported on *Erianthus* and *Saccharum* spp. the author gives an analytical key summarizing their differential characters, synonymy, hosts, and distribution. He considers that the presence of smut (*U. scitaminea*) on cultivated sugar-cane in North America, Trinidad, and British Guiana is doubtful, but states that its report from Brazil has recently been confirmed by Freise [*R.A.M.*, ix, p. 808].

A bibliography of 25 titles is appended.

Abbott (E. V.). **Physiologic forms of Colletotrichum falcatum Went.**—*Phytopath.*, xxiii, 6, pp. 557–559, 1933.

The results [which are tabulated] of a comparative study of four isolations of *Colletotrichum falcatum* from three sugar-cane varieties, viz., L–7 and F–1 from P.O.J. 213 in Louisiana and Florida, respectively, G–2 from Cayana in Georgia, and L–31 from Co. 281 in Louisiana [*R.A.M.*, xi, p. 543], indicate the existence within the species of three physiologic forms. L–7 and F–1 have approximately the same indices of virulence, a measure of which was obtained by calculating the ratio of spread of infection to the total length and width of the inoculated internode and multiplying the longitudinal by the lateral ratios, 1·00 being complete penetration of the length or breadth of the internode and a higher figure representing spread to other internodes above or below. These two isolations are considered to belong to the same physiologic form. L–31 is more virulent on all three varieties than any of the other forms, the susceptibility of the ordinarily resistant Co. 281 being particularly noticeable. G–2 is weakly parasitic in comparison with the others and is classed as a third form. Two kinds of resistance to red rot are possessed by different varieties, namely, (1) functional, by those germinating quickly and forming strong roots, through the primordia of which the fungus is unable to enter; and (2) physiological, by those in which the development of the organism within the stalk tissues is retarded after infection has taken place.

Mout (M. G.) & Sluis (T. A. S.). **Enkele aan plantproven op het gebied van voorbemonstering en te behalen product.** [Some planting tests in connexion with preliminary sampling and the product eventually obtained.]—*Arch. voor Suikerind.*, Deel I, xli, 11, pp. 381–418, 4 diags., 7 graphs, 1933.

A comprehensive and fully tabulated account is given of the writers' investigations in Java of the influence of *Fusarium* attack in causing an imperfect correspondence between the data afforded by periodical samplings of P.O.J. 2878 cane and the actual yields obtained. The severity of the attack is progressive during the ripening period and may result in a heavy reduction in the crop, especially on light soils and in April plantings. The writers recommend the institution of so-called 'history tests' on areas specially set apart for the purpose of observing and studying the progress of infection.

Teng (S. C.). **Some fungi from Canton.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., viii, 2, pp. 121–128, 1932.

An annotated list is given of 41 fungi collected, mostly by the writer, in Canton, China, including *Phytophthora colocasiae* [*R.A.M.*, xi, p. 769] on *Colocasia esculenta*, *Ustilago esculenta* on *Zizania latifolia* [*Z. aquatica*], *U. sacchari* [*U. scitaminea*] on sugar-cane [see preceding page], *Sphaerophragmium acaciae* on *Albizzia lebbek*, *Exobasidium sawadae* on *Cinnamomum cassia*, *Colletotrichum nigrum* and *Gloeosporium piperatum* [both considered to be imperfect forms of *Glomerella cingulata*: ibid., xi,

p. 803] on *Capsicum annuum*, and *Cercospora cruenta* [ibid., xi, pp. 87, 130] on bean (*Phaseolus vulgaris*).

Teng (S. C.). **Fungi of Chekiang. II.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., viii, 2, pp. 103–118, 1 pl., 1932.

A further annotated list is given of 87 fungi (including four new species) collected by the writer in the Chekiang district of China [*R.A.M.*, xii, p. 396].

Teng (S. C.) & Ling (L.). **Fungi of Chekiang. III.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., viii, 3, pp. 271–279, 1 fig., 1933.

A further annotated list is given of 34 species of fungi (including two new ones) collected, mostly by the writers, in the Chekiang district of China [see preceding abstract].

Teng (S. C.). **Fungi of Nanking. III.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., viii, 2, pp. 143–152, 1933.

A further annotated list is given of 41 species of fungi collected, mostly by the writer and C. I. Shen, in the Nanking district of China [*R.A.M.*, xii, p. 395]. Oaks (*Quercus dentata* and *Q. serrata*) were infected by *Erysiphe polygoni* and *Microsphaera alni* [ibid., xi, p. 213], the latter occurring also on chestnut (*Castanea mollissima*). *Glomerella cingulata* is believed to be the primary agent of an anthracnose of *Gingko biloba* leaves, *Pestalozzia sinensis* [ibid., xi, p. 746 and next abstract], which is constantly associated with the lesions, being probably only a saprophyte. *Sclerotium tulipae* [ibid., xi, p. 388] was observed on *Liriope graminifolia* [*L. spicata*].

Shen (C. I.). **Fungi of Nanking. IV.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., viii, 2, pp. 153–161, 1932.

In this continuation (comprising 42 species) of the annotated list of Nanking fungi [see preceding abstract] Latin diagnoses are given of *Pestalozzia sinensis* on *Gingko biloba* [loc. cit.], and of *Phyllosticta caryotae* n. sp. on living leaves of *Caryota ochlandra*. *Colletotrichum ampelinum* var. *parthenocissi* var. nov. was found on living leaves of *Parthenocissus tricuspidata*.

Teng (S. C.). **Fungi of Nanking. V.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., viii, 3, pp. 253–270, 1 fig., 1933.

A further annotated list is given of 71 species of fungi (including three new ones) collected, mostly by the writer, in the Nanking district of China [see preceding abstracts].

Da Camara (E. de S.). **Contributiones ad mycofloram Lusitaniae. Centuria X.** [Contributions to the mycoflora of Portugal. Century X.]—*Rev. Agron.*, xx, 1, pp. 5–63, 54 figs., 1932. [Received August, 1933.]

This is an annotated list of 100 fungi of Portugal [cf. *R.A.M.*, ix, p. 489], 16 of which are stated to be new to science and furnished with Latin diagnoses, while 43 had not previously been

recorded from the country. In these two groups the following may be mentioned. *Physalospora elasticae* was observed in association with *Phyllosticta roberti* on *Ficus elastica* leaves in the Lisbon Colonial Garden. *Leptosphaeria buxina* n. sp. and *L. scolecosporarum* n. sp. occurred on *Buxus sempervirens* and *Quercus suber*, respectively. *Chaetophoma eriobotryae* n. sp. was observed on loquat branches, which also bore *Verticillium cinnamomum* n. sp. Privet (*Ligustrum vulgare*) leaves bore large, yellowish-white, black-bordered spots at the tips and margins due to *Macrophyllosticta ligustri* n. sp. *Ascochyta buxina* and *A. citricola* (the latter in conjunction with *Gloeosporium citri*) were found on *B. sempervirens* and orange leaves, respectively. *Diplodia cinnamomi* n. sp. was observed on cinnamon (*Cinnamomum dulce*) twigs, and *Diplodina antirrhinicola* n. sp. on those of *Antirrhinum* sp. *Coniothyrium shiraianum* was found on bamboo (*Bambusa* sp.) stems.

A subdivision of the genus *Leptosphaeria* Ces. & de Not. is proposed as follows: *Leptosphaeria*, *Leptosphaerella* Sacc., *Dendroleptosphaeria* n. g., and *Lopholeptosphaeria* n. g., and a list is given of the species referred to each of these genera.

Ciferri (R.). **Ustilaginales esotici nuovi o rari. I.** [New or rare exotic Ustilaginales. I.]—*Nuovo Giorn. Bot. Ital.*, N.S., xl, 2, pp. 252–268, 1 fig., 1933. [English summary.]

This is an annotated list of some twenty species of Ustilaginales, mostly from the tropics. It contains seven species which are described as new to science, Latin diagnoses being appended in each case, and also a new genus, *Liroa*, which is established for *Farysia emodensis* (syn. *Ustilago treubii*) on *Polygonum chinense* from Java; the fungus is renamed *L. emodensis*, and a table is given showing the chief differences between the genera *Farysia* and *Liroa*.

Hiratsuka (N.) & Hashioka (Y.). **Uredinales collected in Formosa. I.**—*Trans. Tottori Soc. Agric. Sci.*, iv, 3, pp. 156–165 1933.

An annotated list is given of 60 Uredinales collected by Hashioka in Formosa during 1932. *Uromyces decoratus* on *Crotalaria juncea* and *C. vitatoni* is amongst the species stated to be new to Japan.

Hiratsuka (N.). **On species of the Melampsoraceae collected in Nikko and its vicinity.**—*Trans. Tottori Soc. Agric. Sci.*, iv, 3, pp. 143–155, 1933.

Taxonomic notes [mainly in Japanese, with some Latin annotations] are given on 27 species of Melampsoraceae collected in and around Nikko [*R.A.M.*, xii, p. 596], among which may be mentioned: *Puccinastrum castaneae* on chestnut (*Castanea vulgaris* [*C. sativa*] var. *japonica*); *P. coryli* on *Corylus rostrata* var. *sieboldiana*; *Thecopsora myrtillina* and *T. vacciniorum* [ibid., ix, p. 420] on *Vaccinium uliginosum* and *V. vitis-idaea*, respectively; and *Chrysomyxa expansa* [ibid., ix, p. 205] on *Rhododendron degronianum*.

HOPKINS (J. C. F.). **Rhizoctonia lamellifera Small: a distinct species of the Rhizoctonia bataticola group of fungi.**—*Proc. Rhodesia Scient. Assoc.*, xxxii, pp. 65–79, 4 pl., 1933.

The author states that his comparative studies [details of which are given] have proved the existence of sufficient constant differences between the fungi comprising Haigh's A and C groups of *Rhizoctonia bataticola* [*R.A.M.*, ix, p. 685] to justify their separation into two distinct species. In the first place he points out that the group C (the pycnidial stage of which has been shown by Ashby to be *Macrophomina phaseoli*) is now recognized as a definite parasite of herbaceous plants and a facultative parasite of woody plants, while the A group has only been reported from trees, the authentic records being apparently on *Acacia* in Kenya, *Grevillea*, *Casuarina*, coffee, and *Hevea* rubber in Uganda, and *Citrus*, *Eucalyptus*, mango, *Pittosporum*, and *Pinus* in Rhodesia. Secondly, while *M. phaseoli* is typically associated with a rot of the fibrous or very small lateral roots, the A group occurs typically upon the large lateral and crown roots, a further distinction of the latter group being its ability to penetrate the core of large lateral roots well in advance of the disease in the bark. Parallel studies in culture of four isolations of group A (from orange, grapefruit, and *Hevea* rubber trees) and three isolations of *M. phaseoli* (from *Eucalyptus rostrata*, lemon, and lime) also showed constant distinctive characters of mycelium and sclerotia [which are described at length], permitting of their easy macro- and microscopical distinction, even after the fungi had been in culture for some time and had produced saltating strains which, on suitable treatment, were brought back to normal. It is stressed that throughout all the treatments to which the cultures were subjected, no indication of specific identity between the two groups was observed, though the microscopic structure of the sclerotium is essentially the same in both.

For all these reasons the author considers that the binomial *R. bataticola* should be retained solely for the sclerotial stage of *M. phaseoli*, and suggests re-establishing Small's name *R. lamellifera* [ibid., v, p. 401] for the fungi of the A group, producing sclerotia having an average diameter of about 0·5 mm. in culture and up to 1 mm. or more in the roots of woody plants. It is hoped, by this means, to do away with some of the confusion which has arisen from the promiscuous use of the name *R. bataticola* for all root-inhabiting fungi which produce the sclerotia characteristic of this group of fungi.

While the author has not yet studied in nature the fungi forming Haigh's B group, he can support the latter's statement that they retain their identity in culture, from his observations over a number of years of a *Hevea* strain supplied to him by Small.

GRAINGER (J.) & HEAFFORD (RACHEL M.). **Some effects of the ordinary Tobacco mosaic upon the developmental anatomy of the host plant.**—*Proc. Leeds Phil. Soc.* (*Scient. Sect.*), ii, 9, pp. 406–415, 4 figs., 1933.

This is a brief report of the authors' investigation of the effect on the developmental anatomy of the tobacco (Connecticut Havana

variety) leaf of ordinary tobacco mosaic (Johnson's No. 1 virus) [*R.A.M.*, xii, p. 398]. The results showed that whereas in the healthy young developing leaf vacuolation of the newly formed cells begins first around the region which is to form the midrib, and is followed by that of the future lamina, the effect of the virus in general is to delay the progress of vacuolation of cells of all tissues. In a somewhat later stage isolated groups of cells become vacuolate before the surrounding cells, instead of the normal regular progression of the process from tip to base. The work suggested that if the palisade cells reach complete vacuolation (which checks cell division) before the corresponding epidermal tissue, the result will be the formation of light green areas, while if the vacuolation of these cells is delayed (so that cell division continues longer) a dark green area will be formed, in which the palisade contains a greater number of smaller cells per unit area than in the light green parts. This increase in the palisade is responsible for the upward puckering of the dark green areas and also for the wavy contours of the vertical (side) walls of the epidermal cells of the upper surface which was observed in these areas. If vacuolation in all the tissues of a part of a mosaic-affected leaf proceeds at the same rate and in the same order as in healthy leaves, then no anatomical changes are produced in this part of the leaf.

It was further found that while 'vein-clearing' symptoms may be produced by direct inoculation into young leaves below about 3 cm. in length, no such symptoms are produced in larger leaves; the latter allow the virus to multiply and to spread to the smaller developing leaves which then exhibit the characteristic mottle.

It seems possible to explain the various anatomical features in mosaic tobacco leaves by differences in the relative succession of vacuolation in the several tissues in different areas of the leaf.

KOSTOFF (D.). **A contribution to the sterility and irregularities in the meiotic processes caused by virus diseases.**—*Genetica*, xv, 1–2, pp. 103–114, 15 figs., 1933.

The writer's observations at Leningrad on the female sterility virus of tobacco have already been summarized from another source [*R.A.M.*, xii, p. 600].

Partial sterility in tobacco (*N. tabacum* var. *macrophylla*) and in *Nicotiana triplex* (*N. tabacum* × *N. sylvestris* × *N. rusbyi*) may also be caused by severe mosaic infection, involving a disturbance in the reduction division of the pollen mother cells of some of the floral buds. A relatively high percentage (sometimes up to 50 per cent.) of abortive and abnormally large pollen is then formed, with an excessive number of chromosomes. Details are given of the meiotic processes observed in *N. tabacum* var. *macrophylla*.

Not only may different buds of the same branch be affected to a varying extent, but even various anthers of the same bud. In one flower, for instance, one anther contained 8 per cent. abortive pollen, two 18 per cent., and the remaining two 25 per cent. In very severe cases the flowers set a much smaller amount of seeds than those from normal plants (only 84 in one badly diseased capsule compared with a maximum of 800 in healthy ones).

The writer believes that severe infection of the reproductive organs may initiate certain mutative processes. The abnormalities in the reduction division of mosaic tobacco plants are doubtless connected with metabolic disturbances caused by the virus.

BÖNING (K.). **Zur Biologie und Bekämpfung der Sklerotienkrankheit des Tabaks (Sclerotinia sclerotiorum [Lib.] Massee).** [On the biology and control of the sclerotial disease of Tobacco (*Sclerotinia sclerotiorum* [Lib.] Massee).]—*Phytopath. Zeitschr.*, vi, 2, pp. 113–175, 3 figs., 1 diag., 2 graphs, 1933.

A full account is given of the writer's laboratory and field investigations on the biology and control of *Sclerotinia sclerotiorum* in the Bavarian tobacco fields [*R.A.M.*, vii, pp. 546, 548; x, p. 563], where heavy losses have been caused of recent years by this fungus.

The viability of the sclerotia was found to vary considerably according to the weather conditions prevailing at the time of their production, and also with the mode of overwintering, those kept in the soil usually germinating better than those stored in the laboratory. In the summer of 1931 apothecia were obtained from sclerotia kept under dry conditions since 1927, a year of particularly good viability. Medium-sized sclerotia (0·4 to 0·5 cm.) produced a larger number of apothecia than either the very small (below 0·4 cm.) or very large ones (0·5 to 1 cm. and above), the latter being specially poor in reproductive capacity. Apart from the sclerotia weakened by age or unsuitable methods of storage, all those formed on tobacco plants were induced to germinate, but a large number obtained on carrots by inoculation with two pure cultures of *S. sclerotiorum* from tobacco failed to develop apothecia. Sterility may sometimes be due to insufficiency of oxygen in the culture vessels. Soil temperatures between 15° and 25° C. are generally necessary for sclerotial germination. An absolute water content of the soil above 6·5 per cent. is further requisite for germination, and considerable practical importance attaches to the fact that a protracted dry spell of a month or so, resulting in the desiccation of the sclerotia, retards their germination for at least three to four weeks. Apothecial formation was favoured by the presence of humus in the soil, but hydrogen-ion concentration appeared to have little effect on the process. Germination is most profuse in the uppermost soil layers and in moderately well-shaded sites. The sclerotia of *S. sclerotiorum* are liable to infection by *Cephalothecium* [*Trichothecium*] *roseum*, which may play quite an important part in the reduction of infective material in the soil during seasons of alternating dry and wet periods.

The ascospores of *S. sclerotiorum* were found to be capable of spreading infection in the field over a distance of some 45 m. The mycelium appears to be of little or no importance in the perpetuation of the disease [cf. ibid., ix, p. 655].

Nutrition experiments showed a temporary beneficial effect from an excess of nitrogen, correlated with the retardation of growth in the treated plants and ceasing with renewed development. Under field conditions the health of the crop is most likely to be promoted

by a restricted use of nitrogen coupled with heavy applications of potash.

As a rule the sclerotial disease makes its first appearance in August, when the plants have attained their full development; its severity or otherwise is conditioned by the character of the weather during the preceding two months. Should the last protracted dry spell be longer than three to four weeks ago, sclerotial germination and consequent infection may be expected, whereas if the first half of July or longer is predominantly dry, apothecial development will not immediately take place, as indicated above, even under the influence of heavy rain.

The subject of control is discussed at length. There seems to be little prospect of successful breeding for resistance, and the disease must therefore be primarily combated by cultural measures [which are fully explained], supplemented where necessary by the application of calcium cyanamide to the soil, soil disinfection of small plots with 5 to 10 per cent. formalin, 10 to 20 per cent. carbolineum, or strewing with flowers of sulphur, and spraying with 2 per cent. Bordeaux mixture or other copper-containing fungicides.

AINSWORTH (G. C.). **Virus disease investigations. (a) Spotted wilt of Tomatoes. (b) Mosaic and 'stripe' disease of Tomatoes.**—*Eighteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1932*, pp. 39–45, 1933.

In 1932, tomato plants affected with spotted wilt [*R.A.M.*, xii, p. 59] were received from several widely separated places in Great Britain. The disease now appears to be of frequent occurrence and liable to cause considerable losses to growers of tomatoes and other plants; in the past it has probably been confused with stripe disease [ibid., xi, p. 679].

The symptoms produced on inoculated tomatoes [cf. ibid., iii, p. 307; xi, p. 549] consist in a sudden bronzing of the young leaves in irregular spots, circles, or rings, accompanied by an almost complete cessation of growth. In young plants the young leaves curl downwards and inwards. Affected plants though stunted are seldom killed unless attacked in the seedling stage. Under good growing conditions growth may recommence 10 to 15 days after the initial bronzing, often owing to the development of lateral shoots, but bronze markings usually develop later, and the shoots die back. Recovery was not observed. The virus was not detected in ripe fruits, but its presence was demonstrated in green ones.

The additional hosts determined by inoculation were tobacco, *Nicotiana macrophylla*, *N. glutinosa*, *Datura stramonium*, *Solanum capsicastrum*, garden petunias, dahlias, and nasturtiums (*Tropaeolum majus*). Cinerarias and chrysanthemums were found naturally infected, the latter in a nursery where in the previous spring tomatoes had been severely attacked. The most important agent of natural spread is *Thrips tabaci* [ibid., xi, p. 550], but being transmissible by juice inoculations the disease can also be spread by the hands and pruning knife, though it is less infectious than tomato mosaic. Infective juice was inactivated by filtering through Pasteur-Chamberland filters even when the operation was completed in 45 minutes, after which period unfiltered juice becomes inactive.

Control measures suggested consist in keeping t mato plants as free as possible from insects, especially *T. tabaci*, roguing out plants directly they become affected, and eradicating the alternate hosts, especially those in which the virus can overwinter.

Further investigation of tomato stripe [ibid., xi, p. 679] showed that some relation exists between it and a form of mosaic, for after outgrowing stripe tomatoes often are mottled. Stripe symptoms may be due to a bacterium (*Bacillus lathyri*) [loc. cit.], a single virus, or a mixture of viruses, and the methods of control differ with each type. Plants affected by stripe due to *B. lathyri* or to a single virus ('glasshouse streak') [ibid., x, p. 64; xii, p. 540] tend to outgrow the attack when treated with potash applications though these have no effect on mixed virus stripe, against which nitrogenous applications are indicated.

The commonest form of tomato mosaic in the British Isles is 'ordinary' or 'mild' mosaic. Material obtained from Cheshunt Experimental Station and several commercial nurseries was identical as regards filterability, host range, and resistance to ageing, heat, and chemicals with authentic tobacco mosaic (Johnson No. 1) [ibid., xii, p. 582]. On tomato the incubation period varies from five days in summer to three weeks in winter. In spring and summer an attack results in a mild to moderately severe dark green mottle with slight leaf distortion and stunting; there is no necrosis and the fruit is not marked. In winter no mottling appears but stunting and leaf distortion are more marked than in summer; the 'fern leaf' type of symptom develops and anthocyanin is present in the stem.

Tomato plants affected with single-virus stripe (glasshouse streak) were obtained from a wide area either alone or mixed with tomato mosaic or, more rarely, with spotted wilt. The virus resembles that of mild mosaic in filterability, ageing *in vitro*, and resistance to heat and chemicals; the host range is also similar, but on some hosts the symptoms caused by the two viruses are readily distinguishable. The only symptom of glasshouse streak on tomato may sometimes be a mottle indistinguishable from that caused by tomato mosaic, but when mixed the two viruses retain their individual properties. Passage through tobacco filters out the glasshouse streak from this mixture in certain cases when the latter only causes local lesions and does not become systemic.

The form of stripe ('streak') due to a mixture of viruses [ibid., xi, p. 679] is rare in English glasshouses. It is typically the result of a mixed infection of tomato mosaic and potato mosaic, and can readily be synthesized and analysed. By inoculation of *N. glutinosa* the potato mosaic component can be isolated separately, as it alone becomes systemic; the longevity of the mixed virus *in vitro* is six months, after which the potato mosaic component becomes inactive.

READ (W. H.). **Physiological investigations of mosaic diseases of the Tomato.**—*Eighteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1932*, pp. 45–48, 1933.

Further investigation into the effect of aucuba mosaic upon the composition of the tomato plant [*R.A.M.*, xi, p. 678] demonstrated that about a week after inoculation the diseased plants contained

(in the evening) rather more reducing sugar than the controls, though after twelve hours' darkness the former generally showed an increase and the latter a decrease in the amount of reducing sugar present. The amount of non-reducing sugars present showed a similar overnight difference.

The mean sugar contents of the healthy and inoculated plants showed little difference during the first three weeks after inoculation, partly owing to dull weather. When brighter weather set in the inoculated plants developed typical yellowing and a remarkable increase in reducing sugars as compared with the controls, but after twelve hours' darkness the position was reversed; a similar, though less pronounced effect was produced on the non-reducing sugars.

During the dull weather the diseased plants contained more starch than the healthy ones, but the reverse was the case during the subsequent bright period.

From the eleventh day after inoculation the diseased plants contained rather more nitrogen than the controls, though up to that time there was no appreciable difference.

Downy mildew on Tomato and Pepper.—*Plant Disease Reporter*, xvii, 5, pp. 37–39, 1933. [Mimeographed.]

Pepper [*Capsicum annuum*] and tomato plants were observed by B. B. Higgins in Georgia to be infected by a fungus indistinguishable from the tobacco downy mildew (*Peronospora hyoscyami*) [see above, p. 679] in April, 1933. During 1931 a disease due to a *Peronospora* which they regarded as identical with *P. hyoscyami* was detected by R. F. Poole and F. A. Wolf on tomatoes in North Carolina, while in 1932 G. M. Armstrong investigated an infection of pepper plants in South Carolina which appeared to be due to *P. hyoscyami*, though it might have been *Phytophthora capsici* [*R.A.M.*, xii, p. 535]. Tobacco was infected by downy mildew in all three States.

Wilt-resistant Tomatoes.—*Fruit World of Australasia*, xxxiv, 6, p. 330, 1933.

In the market gardens of New South Wales tomato wilt due to *Fusarium* [*lycopersici*] is being well controlled by growing resistant varieties. The Department of Agriculture is arranging for the distribution of seed of the resistant strain of the Marglobe variety [*R.A.M.*, x, p. 416]. Among the most resistant varieties tested, a new one, Pritchard, ranked with Marglobe and Break of Day. The cross, Earliana, obtained from the highly resistant Red Currant Tomato, was grown to the third generation and showed individuals of promise. The most promising variety for glasshouse purposes at present is M.C. from Palestine.

Jermiess. **Bekämpfung der Braunfleckenkrankheit der Tomaten mit Hilfe des Schwefelvernebelungsapparates 'Sulfurator'.** [Control of Tomato leaf mould with the aid of the sulphur vaporization apparatus 'Sulfurator'.]—*Obst- und Gemüsebau*, lxxix, 6, pp. 89–90, 1933.

Practically complete control of tomato leaf mould [*Cladosporium*

fulvum] is stated to have been obtained in 1932 in the market-gardening district of Vierlande [Hamburg] by sulphur fumigation of the glasshouses (at intervals of three weeks from the beginning of June to the end of August) with the Sulfurator apparatus [*R.A.M.*, xii, p. 642]. In neighbouring untreated houses the plants were severely attacked and many died prematurely. The apparatus had originally been purchased to combat rose mildew [*Sphaerotheca pannosa*], against which it proved thoroughly effective.

CHAMBERLAIN (E. E.). **Blossom-end rot of Tomatoes. Its appearance, cause, and preventive treatment.**—*New Zealand Journ. of Agric.*, xlvi, 5, pp. 293–296, 2 figs., 1933.

Both in the glasshouse and in the field the most serious fruit rot of tomatoes throughout New Zealand is blossom-end rot [*R.A.M.*, xi, pp. 26, 698]. The disease appears to be due to lack of soil moisture. In the field it generally occurs on light, sandy soil and is often confined to dry, sandy or gravelly ridges. The heaviest losses are sustained in vigorous, sappy plants irrigated and then left without water. Vigorous plants became affected when removed from a shaded to an unshaded glasshouse, though similar plants left in the shaded glasshouse remained unaffected.

Preventive measures consist in providing an adequate, regular supply of water, especially after the fruit has started to develop, ensuring steady growth, and avoiding forcing, especially where dry conditions are expected during fruiting. Nitrate of soda should be used as a nitrogenous fertilizer instead of sulphate of ammonia or blood manure. Glasshouses should be whitewashed to afford shade, and in the field sandy soils and ridges should be avoided.

A bibliography of 10 titles is appended.

BEATTIE (R. K.). **Diseases threatening ornamental and forest trees.**—*Journ. Econ. Entom.*, xxvi, 3, pp. 621–624, 1933.

Briefly recapitulating the outlines of his paper (in collaboration with W. A. Orton) on the biological basis of foreign plant quarantines [*R.A.M.*, iii, p. 111], the writer cites a number of diseases threatening American ornamental and forest trees, the early detection and control of which require the zealous co-operation of pathologists, mycologists, and nursery inspectors.

In 1930, 302 specimens were cultured at Wooster, Ohio, under the supervision of C. May to determine the presence or absence of elm disease (*Graphium* [*Ceratostomella*] *ulmi*); in 1931, 600; and in 1932, 453 (representing 19 different States in the last-named year) [ibid., xii, p. 404].

In connexion with studies by G. G. Hahn on larch canker (*Dasyscypha willkommii*) [*D. calycina*: ibid., ix, pp. 90, 501], it has been ascertained that *D. ellisiana*, normally saprophytic on pine in the eastern seaboard States and unknown west of the Alleghanies, has become a parasite of Colorado Douglas fir [*Pseudotsuga taxifolia*] introduced into Rhode Island.

No fresh sites of Scotch pine [*Pinus sylvestris*] infection by Woodgate rust (*Peridermium* sp.) [ibid., x, p. 83] have been detected recently.

H. H. York has observed a canker disease, characterized by copious resin exudations, severely attacking the crowns and upper roots of red and white pines [*Pinus resinosa* and *P. strobus*] in New York plantations (*Journ. of Forestry*, xxx, p. 505, 1932). The cause, place of origin, and extent of the disease are still unknown.

The needle blight of [Colorado] firs [*Abies concolor*] due to *Rehmiellopsis bohemica*, recently described from Massachusetts by Alma M. Watermann and M. A. McKenzie [ibid., xii, p. 408], has since been recorded from three localities in Maine and five in New York.

Buisman (Christine). **Iepencultuur en Iepenziekte in Italië.**—[Elm cultivation and Elm disease in Italy.]—*Nederl. Boschbouw-Tijdschr.*, vi, 5, pp. 147–152, 4 figs., 1933.

Besides being extensively planted along the streets, elm trees in Italy find two important secondary uses, namely, the trunks as vine supports (especially in the province of Emilia) and the foliage as fodder for stock. The occurrence of the elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xii, p. 404] is, therefore, of considerable importance. In Tuscany *Acer campestre* is used for vine supports in place of elms, and an attempt is being made to substitute the former for the latter in the Bologna district, where infection by *C. ulmi* has made rapid progress during the last four years and involves 25 per cent. of the elm supports in some vineyards. *A. campestre*, however, is attacked near Bologna by *Verticillium albo-atrum* [ibid., xi, pp. 411, 755; xii, p. 470], so that doubts are felt as to the advisability of its introduction on a large scale. The insects primarily concerned in the transmission of the elm disease in Emilia have been identified as *Scolytus multistriatus* and *Pteleobius vittatus*.

The elm generally cultivated in Italy appears to be a susceptible species of the small-leaved *Ulmus foliacea* type, possibly var. *italica*, and the best prospect of eliminating the disease would appear to lie in its replacement by a resistant species, such as the so-called 'Siberian' elm (*U. pumila* var. *pinnato-ramosa*) [ibid., xii, p. 665], a consignment of which has been procured from the United States for testing at a Bologna nursery.

Troup (R. S.). **Some problems of British forestry.**—British Science Guild, 13 pp., 1933.

Among the problems of British forestry briefly outlined in an address before the British Science Guild on 19th June, 1933, mention was made of the extensive losses reported to be caused by *Stereum spadiceum* among oaks in the Forest of Dean. The fungus enters the trunks of the trees through dead branches and produces a heart rot that ultimately destroys the whole interior.

Sempio (C.). **Sulla progressiva distruzione delle alberate di Platani in alcune zone dell' Italia Centrale.** [On the progressive destruction of Plane trees in certain regions of Central Italy.]—*Riv. Pat. Veg.*, xxiii, 3–4, pp. 129–170, 7 pl., 1933.

For some years *Platanus occidentalis* in central Italy, particu-

larly in Perugia, has been attacked with increasing severity by *Gnomonia veneta* [*R.A.M.*, viii, p. 76], the hard winter of 1929 especially predisposing the trees to attack. Some of the trees are already dead and others dying. A detailed study was made of an outbreak in 1932.

The conidial stage, *Gloeosporium nervisequum*, appeared on the leaves in May after a dense mist, causing considerable defoliation, and it was observed that the moderately sized branches bore, especially towards the apex, irregular woody swellings often so covered with short twigs as to resemble witches' brooms. Cone-shaped or irregular nodules also sometimes formed on the thick branches and trunk.

In most cases attack on the branches appeared to arise from previously infected twigs, the infection of the latter being at the nodes, where a brownish lesion developed and spread to the cambium. The mycelium was difficult to observe in the living tissues but developed extensively after the death of the tissues, especially in the pith and xylem. Attack took place at the end of winter, presumably from overwintered pycnospores of the *Discula platani* stage of the fungus, or possibly from the ascospores. It spread down to the branch bearing the twig, penetrating the cambium and wood of the branch and leading to localized hypertrophy of the latter, presumably by the action of some toxic substance. The swellings contained much distorted vascular and woody tissue, a great part of their cells was occupied by a reddish brown substance, and the part of the branch beyond them was frequently killed. The smaller nodules found on the large branches, sometimes very closely crowded, are considered to be due to localized infections also arising from killed-back twigs.

The leaf form of the fungus, *G. nervisequum*, always developed, in the author's experience, soon after the attack on the twigs. As infection of the woody parts constitutes a permanent focus for the parasite, the author recommends the pruning out of all diseased branches.

Extensive studies of the biology of the fungus are reported. It proved readily cultivable from the *Discula* stage, the optimum development occurring at 15° to 16° C., and the pycnidia maturing in 9 or 10 days.

Inoculations on seedlings with the pycnospores or conidia gave generally unsatisfactory results but in two cases with the former successful infection was secured. In one of these a two-year-old seedling was successfully infected through the leaves and tips of the branches and acervuli of *G. nervisequum* developed on the former. In the other a lateral branch was infected and died back to the node next below but bore no fructifications, though the leaves on it developed acervuli as before. The incubation period was about a month.

A bibliography of 32 titles is appended.

Gesetze und Verordnungen. [Laws and regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 6, p. 47, 1933.

Germany (Schleswig-Holstein). A police regulation of 27th March, 1933 (effective 1st May) introduces certain modifications

into the barberry eradication order of 7th August, 1930 [against *Puccinia graminis*]. Under the present provisions, the growing of 14 species of *Berberis* (including *B. aetnensis*, *B. canadensis*, *B. fendleri*, and *B. vulgaris*, with its varieties) is prohibited within 200 m. of arable land. Wild barberries growing within this distance of cultivated fields are to be eradicated and destroyed by the owners of the land on which the plants occur.

Southern Rhodesia. Act to provide for the suppression of Tobacco pests.—66 pp., 1933.

The Tobacco Pest Suppression Act, 1933 (repealing that of the same title of 1931) defines the measures to be taken for the extermination of pests and diseases of cured and growing tobacco. Inspectors duly authorized by the Minister of Agriculture are empowered to enter tobacco plantations and to take the necessary steps for the eradication of any pests or diseases found thereon, including the destruction of growing tobacco plants (if self-sown or abandoned as useless) and of alternate hosts and weeds. By a given date each year growers must destroy all tobacco plants or stalks and alternate hosts (to be declared by the Governor) on their land, failing which the work will be carried out under the instructions of the Minister of Agriculture at the owner's expense. By Government Notice No. 367 (1 p., 9th June, 1933) leaf curl [*R.A.M.*, xii, p. 158] is scheduled under the Act, and the 1st August is fixed as the date by which destruction of growing tobacco plants is to be completed.

Legislative and administrative measures. Argentine Republic.—*Internat. Bull. of Plant Protect.*, vii, 6, p. 128, 1933.

By Presidential Decree of 22nd August, 1932, *Pseudomonas savastanoi*, the causal organism of bacterial tumours of the olive [*R.A.M.*, x, p. 46; xii, p. 458], has been declared an agricultural scourge.

Packing materials quarantine. Amendment No. 1 to notice of Quarantine No. 69.—*U.S. Dept. of Agric. Office of Inform. Press Service*, 2 pp., 1933. [Mimeographed.]

Amendment No. 1 to notice of Quarantine No. 69, effective as from 1st July, 1933, authorizes the admission into the United States of certain common packing materials, prohibited from entry under the Quarantine, e.g., rice straw, maize and allied plants, cotton and cotton products, sugar-cane, bamboo, plant leaves, forest litter, and soil [*R.A.M.*, xii, p. 464], provided they have been prepared in such a way that, in the judgement of a qualified inspector, no risk of pest introduction is involved.